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ABSTRACT

This resource book was developed to help home economics teachers reinforce academic principles in mathematics; science, and language arts while teaching essential home economics content. Separate sections of the book are written for each academic area. Each section begins with an overview and update of the academic area based on a review of literature and input from experts. A rationale is given for designating certain skills as fundamental for success and productivity in society, and current instructional trends in each area are discussed. Following this overview, principles are identified that are considered essential to competence in each academic area; they are explained, defined, and elaborated with specific examples. A section on learning and evaluation experiences contains suggestions for applying principles of mathematics, science, and language arts to specific home economics content areas. Suggestions are intended to provide usable activities for classroom implementation, and adaptations for exceptional students are suggested. Educational trends involving integrated instructional approaches, critical and higher-level thinking skills, and cooperative learning are addressed in the final section of the book. Eleven teaching aids (handouts or transparency masters) and 20 references are included. The book is indexed. (KC)

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Home Economics Curriculum

CE 059 844

Home Economics Education
Texas Education Agency
Austin, Texas

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Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum

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Introduction

Academic Skills

Importance

The core principles of mathematics, science, and language arts are essential to the development of strong academic skills. These skills are fundamental to the learning process; they form the base on which lifelong learning can be built. A strong foundation in mathematics, science, and language arts is essential to academic success, employability, and personal fulfillment and well-being.

Strong academic skills have become the focus of renewed interest and concern in recent years. Research and standardized tests point to a perceived decline in the level of these skills among American students. Educators, legislators, employers, and economists are among those urgently voicing the need to raise the level of competence in academic skills. Not only individuals but also families, employers, and society are affected by academic skill levels. Much research is being conducted to monitor academic skill levels and to assess the influence of these levels, positive or negative, on persons in various life stages.

From a positive standpoint, persons who possess higher levels of academic skills are more likely to succeed in school, pursue higher education, have access to more and better jobs, and earn higher wages than those persons lacking competence in academic skills. Mastering academic skills contributes to self-esteem and enables individuals to continue learning throughout their lifetimes. In addition, competence in academic skills provides continuing access to varied opportunities throughout life.

> "A strong foundation in mathematics, science, and language arts is essential to academic success, employability, and personal fulfillment and well-being."

Conversely, persons with inadequate academic skills are more likely to drop out of school, become adolescent parents, have fewer job opportunities, and earn lower wages. They are at risk as teenagers and will be denied access to many opportunities throughout life if they remain deficient in academic skill competence.

Vocational Home Economics Application

Home economics teachers have a vital interest in strengthening students' academic skill competence. Concern for the well-being and success of students, both now and in the future, is the key motivator for teachers. As discussed above, students' success is very dependent on their exhibiting academic skill competence.

Principles of mathematics, science, and language arts have always been reinforced in home economics courses. In the process of teaching employability and practical living skills, academic skills have been naturally strengthened. So, in one sense, teaching academic principles and skills is not new to home economics teachers.

However, with the current broad educational emphasis on academic skills, teaching, reinforcing, and applying the skills and underlying principles have become requirements. The integration of academic skills is thus acquiring new emphasis. Teaching of academic skills must be more intentional and more identifiable. How well and how visibly academic skills are taught more directly impacts evaluation of individual teachers as well as the vocational home economics program as a whole.

Therefore, it is important that teachers attain the following goals in order to integrate academic skills into vocational learning:

- Know the fundamental principles of mathematics, science, and language arts that are most applicable to home economics content areas.
- Learn to reinforce mathematics, science, and language arts principles more effectively while teaching specific course content.
- Readily identify the reinforcement of academic principles.
- Make students, parents, the public, and other professionals aware that academic principles and skills are being reinforced in home economics classes.

Guide to Use

Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum is intended to serve as a resource assisting home economics teachers in accomplishing the goals outlined above. It is recognized that teachers already face a formidable task in adequately covering essential content. Therefore, suggestions for integrating academic principles are not intended to increase content load but to enable teachers simultaneously to teach essential home economics content while reinforcing academic skills. Additionally, through the process of integrating academic skills, the learning and appreciation of the home economics content itself will be intensified.

Separate sections of this book are devoted to each of three academic areas selected for coverage at this time: mathematics, science, and language arts. Each section begins with an overview and update of each academic area based on a review of literature and input from educators and resource persons. Rationale is given for designating certain skills in mathematics, science, and language arts as fundamental for achieving success and productivity in today's society. Current instructional trends in each specific area are also discussed.

Next, principles are identified that are considered essential to competence in each academic area. Since all teachers do not specialize in each of these academic areas, and since content, terminology, and instructional approaches are constantly updated, these principles are explained, defined, and elaborated. Specific examples are given to clarify understanding and generate ideas for teaching the academic principles in home economics curriculum.

The "Learning and Evaluation Experiences" section of this book contains suggestions for applying principles of mathematics, science, and language arts to specific home economics content areas. Suggestions are intended to provide usable activities for classroom implementation, but they are not all-inclusive. It is hoped that the examples provided will generate ideas for many other related learning and evaluation experiences.

> "Suggestions for integrating academic principles are not intended to increase content load but to enable teachers simultaneously to teach essential home economics content while reinforcing academic skills."

It is recognized that suggested learning and evaluation experiences will often need to be adapted. Different classes contain students at various age and developmental levels, and students within one class usually possess varied levels of academic skills. For example, students with handicaps and limited English proficient students may require remediation in some academic skills. The "Teaching and Evaluation Strategies" section of this book addresses these challenges and offers insights into some changing instructional approaches in mathematics, science, and language arts. Opportunities are also suggested for home economics teachers to work with other teachers in a collaborative effort to integrate vocational and academic education.

Information, Technology, and Instructional Trends

In mathematics, science, and language arts, the instructional push is toward identifying and implementing strategies that empower students to learn actively and independently and to apply learning in all aspects and stages of life. Two prime factors behind this push are the societal trends of expanding technology and vastly increasing quantities of information.

Expanding, rapidly advancing technology continually provides new tools and methods for discovering and processing information. Calculators and computers have expanded human capacity to grasp and process vast amounts of information and have replaced many manual methods. Technological capabilities continue to increase constantly and at a quickening pace.

Vastly increasing quantities of information virtually bombard individuals today, and enhanced communications and media technology provide new means of transmitting this information to more of the population. Terms such as *information explosion* and *information age* depict this growth in the total body of information. It has been estimated that the amount of information currently available to the population will double within a few years.

Information and technology each fuel the other's growth. New developments in technology lead to discovery of additional information; expanded knowledge leads to new technological discoveries. While estimates vary regarding the rate at which this process will continue to expand, it is clear that managing information and technology will be a primary challenge in the future.

Therefore, a primary challenge of education has become the preparation of students to effectively and selectively manage and process information and to appropriately choose and correctly utilize technological tools. Rather than mastering and memorizing specific information and procedures, students must learn to learn. It has become impossible to teach a standardized set of facts and methods that will remain valid throughout one's life. Rather, educators must more selectively teach less content while teaching students to think critically and at higher levels, to choose and adapt the most appropriate methods and tools to accomplish specific goals, and to work cooperatively with others to achieve common goals.

More specific trends in each academic area are discussed in the individual sections on mathematics, science, and language arts. Educational trends involving integrated instructional approaches, critical and higher-level thinking skills, and cooperative learning are addressed and elaborated in the "Teaching and Evaluation Strategies" section of this book.

Fundamental Principles of Mathematics

Introduction

Mathematics competence is essential to success in society. Mathematics is an essential academic skill; its mastery provides the base for understanding and processing information about one's world and for analyzing data and solving problems in everyday life. Mathematics concepts and principles form the foundation of science and technology.

Jobs in the future will require increasingly advanced knowledge and skills in mathematics. Fewer jobs are predicted to be available in manufacturing, and new jobs will develop in fields such as service, information, and electronics. Because computers now process vast amounts of information that was previously available only in highly specialized fields, the ability to analyze and understand such data is becoming a commonly required skill in the workplace. Advanced levels of mathematics skills were once considered necessary primarily for postsecondary education and specialized occupations. Increased skill levels are now needed by high-school graduates entering this changing, more technologically advanced workplace.

Competence in mathematics has always been a major goal of education. As technology and information levels are increasing, mathematics instruction is undergoing change. Mathematics skills essential for future success and instructional methods that can best develop these skills are being identified. Task forces, special commissions, educators, and other groups are looking to the future in order to clarify the fundamental principles of mathematics. Results of these investigations provide valuable information for both academic and vocational teachers attempting to raise mathematics skill levels of students.

Mathematics Competence

Mathematics involves a scientific process of thinking. This process begins with students learning to represent items in the world around them abstractly and to assign numbers and symbols to these abstract items. Students learn to count and to perform basic computations according to rules they deduce or are taught. As mathematics competence grows, students learn to explore new relationships, to reason, and to apply the skills they have developed to real-world situations.

Mathematics competence once relied heavily on memorization of rules and facts; the current emphasis is on mastering the process, using and applying mathematical principles, and developing skills. Students should be able to reason logically and solve problems by utilizing mathematics skills. Students still need to memorize some facts and algorithms, but it is important that students be able to select the best methods of solving particular problems. For example, some mathematics problems require traditional paper and pencil resolution, some mathematics problems may be solved by mental calculation or approximation, and many mathematics problems can best be solved by use of a calculator or computer program. Today's technological society provides many options for problem solving, and students must be equipped to make wise choices of options and to make maximum use of the tools available. Students need practice in selecting the most appropriate mathematics procedures to use in solving particular problems. They also need practice in using calculators, computers, and other tools commonly available to them.

Mathematics competence hinges on students having confidence in their abilities and feeling free to explore within the mathematics process. Lack of confidence in mathematics skills creates anxiety and fear of failure. To avoid or overcome this fear, students should be given many opportunities to practice mathematics, especially in familiar areas of personal interest. Students need to apply mathematics skills to real-life situations that are important to them. When students perceive mathematics as useful, as a tool to help them achieve their own goals, they are more likely to feel comfortable and confident in applying mathematics concepts and processes.

It is also essential that students be fully aware of the importance of mathematics competence to their future employability. Since many jobs require increasingly higher levels of mathematics skills, students should be encouraged to develop and practice skills that they can relate to vocational goals. Vocational home economics courses provide excellent opportunities for students to practice mathematics skills in job-related situations.

The following principles facilitate mathematics instruction:

- Mathematics is a process of thinking; it involves reasoning and problem solving.
- Students gain competence by practicing mathematics; current emphasis is more on application and use of mathematics skills and less on accumulation of knowledge.
- Students learn best when they have confidence in their own mathematics abilities and feel free to explore information, relationships, and options.
- Students need to understand why mathematics mastery is important to them, both now and in the future. They need to be educated about societal trends that are raising skill requirements for future employability.
- Students are motivated to build mathematics competence when they are given opportunities to apply concepts and skills to real-life situations of personal interest.

Principles of Mathematics

Mathematics is a means of problem solving, reasoning, and communicating. It provides the tools for both science and technology. Mathematics instruction begins with basic number sense. Students first study *arithmetic*, which is the basic theory of numbers and computation. They begin to learn about measurement, space, and patterns and relationships among entities.

Concepts from the various specialized fields of mathematics, once taught at higher grade levels or in specific courses, are integrated into early mathematics instruction. As students master the concepts and advance in grade levels, they are introduced to more complex concepts in each field, and courses become more specialized in content and application.

> "Mathematics is a means of problem solving, reasoning, and communicating. It provides the tools for both science and technology."

Mathematics fields include the following:

- algebra – In *algebra*, numbers and values are represented by letters or symbols. Relationships between the values and generalized statements about the values are explored and manipulated. For example, the variable *x* may be used in an equation instead of a number value.
- geometry – *Geometry* is the branch of mathematics that deals with spatial measurements and relationships. Geometry explores points, lines, angles, planes, and shapes.
- trigonometry – *Trigonometry* applies the mathematical properties of triangles and related circular functions to solving problems and explaining relationships. Trigonometric principles form the basis of navigation, surveying, and engineering.
- calculus – *Calculus* utilizes principles from the other branches of mathematics to explore limits, rates of change, and infinite processes.
- probability – *Probability* is a mathematical theory for determining the likelihood of an event occurring based on statistical data.

Various groups interested in mathematics competence have attempted to identify principles of mathematics from the various mathematical fields that are most essential for all students to master. Table 1 contains selected concepts and skills essential to mathematics competence that can most appropriately be integrated into home economics courses. These concepts and skills reflect the central concepts of the essential elements for high school mathematics approved by the Texas State Board of Education in October, 1989. A wide range of concepts have been included to provide the individual teacher flexibility in meeting varying needs of students. Concepts range from those in fundamental mathematics to basic algebra principles. Since mathematic skill levels vary among school districts, courses, and students within a course, the individual teacher can best determine appropriate concepts to integrate.

Reinforcing Mathematics Principles in Home Economics

In this section, fundamental principles of mathematics are explained. Table 2 through Table 8 contain specific examples to clarify each concept and to generate ideas for developing additional learning and evaluation experiences. Simpler concepts should be selected for students in lower grades or with lower skill levels; more challenging concepts can be integrated into lesson plans for students with more advanced mathematics skills. Where more advanced concepts are applicable, collaboration with a mathematics instructor is recommended for broader development and presentation of concepts.

> "The goal is to teach essential home economics content while simultaneously reinforcing mathematics skills."

There are many opportunities for reinforcement of mathematics skills in home economics instruction. Once fundamental mathematics principles are identified, opportunities for reinforcement should become more evident. Remember, the goal is to teach essential home economics content while simultaneously reinforcing mathematics skills. Students can thus be given additional opportunities both to learn specific course elements and to gain practice, competence, and confidence in mathematics.

For all vocational students, application of mathematics principles in problem-solving situations reinforces mathematics skills and builds employability and living skills, thus enhancing home economics content. In addition, students with lower levels of skills may find mathematics instruction in a vocational course to be less threatening than in an academic course.

Mathematic Concepts and Skills

Understand numbers and the place value system.
- Use the operations of addition, subtraction, multiplication, and division of whole numbers and integers in problem-solving situations.
- Use the operations of addition, subtraction, multiplication, and division of fractions and decimals in problem-solving situations.
- Determine equivalencies between fractions, decimals, percents, and ratios and use the appropriate form to solve problems.
- Compare and round decimal fractions.
- Use ratio, proportion, and percent in problem-solving situations.

Apply measurement concepts and skills using metric and customary units.
- Identify and use appropriate units of measure.
- Solve word problems through problem-solving activities involving units of measure, including conversions within a system but not between systems.
- Solve ratio and proportion application problems.

Understand properties and relationships of geometric shapes and their applications.
- Understand basic elements of geometry.
- Use appropriate formulas to solve perimeter, area, circumference, surface area, and volume problems.
- Apply geometric properties to a variety of situations and nonroutine problems.

Practice algebraic concepts and skills.
- Classify real numbers as members of the appropriate subset.
- Identify and use properties of real numbers.
- Investigate and use the order of operations.
- Write and evaluate linear expressions from verbal descriptions.
- Use the properties of equality in the equation-solving process.
- Determine the solutions to problem situations by writing and solving linear one-variable equations and inequalities.
- Graph and interpret a set of ordered pairs of numbers.
- Graph linear equations or formulas.

Use probability and statistics to collect and interpret data.
- Use counting methods and factorials to solve problems.
- Calculate the probability of simple and compound events.
- Collect, organize, and interpret data.
- Construct charts, graphs, and frequency tables from given data.
- Find measures of central tendency (mean, median, and mode) and use each appropriately.
- Make predictions and engage in problem-solving applications using charts, graphs, frequency tables, measures of central tendency, and probability calculations.

Solve problems by selecting and matching strategies to given situations.
- Estimate answers before solving and determine the reasonableness of answers after solving problems.
- Use a wide variety of problem-solving strategies.
- Use calculators and/or computers to solve problems.

Table 1

Mathematic Concepts and Skills

Apply concepts and skills involving personal finance.
- Compute income and wages.
- Interpret payroll deductions such as social security, income tax, retirement, insurance, and savings.
- Compare costs and savings on consumer purchases.
- Determine taxes, including sales, excise, and hidden taxes.
- Develop and maintain a personal budget.
- Open and maintain simulated checking and savings accounts, filling out forms, doing computations, and balancing statements.

Table 1 – continued

Understand Numbers and the Place Value System

The *place value system* refers to the value a digit has because of its placement in a number. For example, in the number 325, the 3 represents three hundreds, the 2 represents two tens, and the 5 represents five ones; 325 can be read three hundred twenty-five, or three hundreds plus two tens plus five ones.

Concepts	Explanations and Examples
Use the operations of addition, subtraction, multiplication, and division of whole numbers and integers in problem-solving situations.	**Explanation** • An *integer* is one of the set of whole numbers or their opposites. **Example** • Provide opportunities for students to practice basic mathematic operations with whole numbers and integers. Expressions such as add, what is the sum, what is the total, how many are left, how many per person, and compute are clues that mathematic principles are being reinforced. The following situations involve basic mathematic operations: – Total the number of persons in various groups who will attend an FHA/HERO function. – Total the responses on a test or survey. – Subtract points from the total grade on a test score. – Determine the percentage of persons who are not expected to attend a function. – Multiply cost per unit of life insurance by the number of units to be purchased. – Multiply square footage of space per child by the number of children in a child care center. – Divide *x* number of objects among *y* number of children.
Use the operations of addition, subtraction, multiplication, and division of fractions and decimals in problem-solving situations.	**Examples** • Computations involving money, such as the following, provide practice with decimals: – Total entries on a deposit slip. – Subtract entries in a checkbook. – Multiply cost per unit to find total cost. – Divide total cost by the number of ounces to find unit cost. • Recipes contain many fractional amounts; increasing or decreasing servings provides practice with fractions. Clothing construction also draws on knowledge of fractions. Problems relating to fabric purchase and sewing or alterations reinforce mathematic skills with fractions.

Table 2

Understand Numbers and the Place Value System

Concepts	Explanations and Examples
Determine equivalencies between fractions, decimals, percents, and ratios and use the appropriate form to solve problems.	**Explanation** • Teaching Aid 1, Equivalencies between Fractions, Decimals, and Percents, reviews equivalencies between fractions, decimals, percents, and ratios. • A *ratio* is the relation between two numbers. If there are 9 males and 12 females in a family health class, the ratio of males to females is 9 to 12, 9:12, or 9/12. **Examples** • Change fractions to decimals or percents (1/5 = 0.20 or 20%). Joe spent 1/5 of his monthly earnings on automobile expenses; what percent did he spend? • Change decimals or percents to fractions (0.25 or 25% = 1/4). Joe spent 25% of his earnings on apartment rent; construct a circle graph depicting the fractional portion of the total spent on rent.
Compare and round decimal fractions.	**Example** • When decimals do not have the same number of digits, students may need to add zeros to make the decimal places equal before comparing. For example, in comparing 0.51 with 0.492, 0.510 > 0.492 is more easily compared. At a pay-by-weight salad bar, John's salad weighs 0.75 of a pound and Maria's weighs 0.694 of a pound; who will pay more?
Use ratio, proportion, and percent in problem-solving situations.	**Explanation** • A *proportion* is a statement that two ratios are equal (2/3 = 6/9). If one variable in a proportion is missing, it can be computed to solve a problem. **Example** • Proportion and percentage are basic to consumer skills such as comparison shopping, determination of discounts and markups, comparison of interest rates and investment options, and comparison of credit and loan sources. Proportions enable one to adapt recipes and serving quantities, to make pattern and clothing alterations, and to compute income and wages. If a recipe that serves six persons calls for 3.5 pounds of fish, how much fish is required to serve fifteen persons? (6/3.5 = 15/*x*) Proportion allows extensions of costs, distances, and other units. If three pounds of hamburger meat cost $4.85, what is the cost of ten pounds? (3/$4.85 = 10/*x*) Computing interest provides practice with percents. If the bank pays 7.5% interest on $150.00, what is the total dollar amount of interest?

Table 2 – continued

<table>
<tr><th colspan="2">Apply Measurement Concepts and Skills
Using Metric and Customary Units</th></tr>
<tr><th>Concepts</th><th>Explanations and Examples</th></tr>
<tr><td>Identify and use appropriate units of measure.</td><td>Explanation
Students require skills in measuring time, length/distance, weight/mass, temperature, and money. The SI metric system is commonly used worldwide; <i>SI</i> is the symbol for <i>Systeme Internationale</i>, the French name for international system. Teaching Aid 2, Metric Units of Measure, overviews SI units of measure. In the United States, both metric and customary units of measure are used. The following chart summarizes measurement units of both systems:
<table>
<tr><th></th><th>Metric</th><th>Customary</th></tr>
<tr><td>Length</td><td>mm, cm, m, km</td><td>in, ft, yd</td></tr>
<tr><td>Volume</td><td>ml, l</td><td>t, T, oz, c, pt, qt, gal</td></tr>
<tr><td>Weight/Mass</td><td>g, kg, t</td><td>oz, lb, t</td></tr>
<tr><td>Temperature</td><td>°C</td><td>°F</td></tr>
</table>
Example
Provide students with opportunities to observe and utilize metric and customary measuring tools. Bulletin boards and other visual aids can reinforce measurement concepts, techniques, and tools specific to individual home economics content areas. For example, show how to read thermometers in family health courses; demonstrate carpentry and architectural measuring instruments in housing and interior design courses; and display various measuring cups and spoons used in food science and nutrition courses.</td></tr>
<tr><td>Solve word problems through problem-solving activities involving units of measure, including conversions within a system but not between systems.</td><td>Example
Incorporate problem-solving activities involving measurements in learning and evaluation experiences, including conversions within a system. Have students convert feet to yards, cups to pints, ounces to pounds, meters to kilometers, milliliters to liters, or kilograms to metric tons. Problem-solving activities dependent on measurements include the following:
– interpreting housing floor plans
– calculating space requirements for child care facilities
– designing store arrangements and displays
– determining the relationship of nutritional practices to body weights of children or elderly persons</td></tr>
</table>

Table 3

Apply Measurement Concepts and Skills Using Metric and Customary Units	
Concepts	**Explanations and Examples**
Solve ratio and proportion application problems.	**Example** • Ratio and proportion applications, previously discussed on page 15, are also useful in solving application problems related to measurements. For example, students might measure a window and compute the required fabric yardage for constructing draperies. If 12.5 yards of fabric cost $48.00, what will 36 yards cost? Scale drawings also require ratio and proportion applications. If 1/4" represents 1', what length does 2 1/4" represent?

Table 3 – continued

Understand Properties and Relationships of Geometric Shapes and Their Applications

Concepts	Explanations and Examples
Understand basic elements of geometry.	**Explanation** • Geometry deals with spatial measurements and relationships. Geometric figures include the following: – A *point* is a location in space, represented by a dot; $\cdot A$ is read *point A.* – A *line* is a collection of points extending without end in opposite directions; $\overset{\longleftrightarrow}{B\quad C}$ is read *line BC* and represented by the symbol $\overleftrightarrow{BC}$. – A *ray* is a portion of a line with one endpoint; $\overset{\longrightarrow}{D\quad E}$ is read *ray DE* and represented by the symbol $\overrightarrow{DE}$. – A *segment* is a portion of a line with two endpoints; $\overset{\rule{2em}{0.4pt}}{F\quad G}$ is read *line segment FG* and represented by the symbol $\overline{FG}$. – An *angle* is the union of two rays with a common endpoint; $I\angle^{H}_{J}$ is read *angle HIJ* and represented by the symbol $\angle HIJ$. – A *plane* is a set of points that extends without end and has no thickness; a plane is represented by the symbol ▱. – Three-dimensional shapes include rectangular prisms, cubes, triangular pyramids, cones, cylinders, and spheres. **Example** • Art, design, and construction principles and procedures relate to basic elements of geometry. Point out to students that whenever they work with points, lines, planes, and three-dimensional shapes, they are dealing with spatial relationships and geometry. Use terminology that reinforces basic geometry concepts. For example, refer to a wall, countertop, or floor as a plane; note that when measuring objects, students are finding the lengths of line segments.
Use appropriate formulas to solve perimeter, area, circumference, surface area, and volume problems.	**Explanation** • Symbols used in solving perimeter, area, circumference, surface area, and volume problems are as follows: A – area b – base of a polygon C – circumference of a circle d – length of diameter h – height l – length r – length of radius s – length of a side V – volume w – width π – pi; the ratio of the circumference of a circle to its diameter (3.14159265…)

Table 4

Understand Properties and Relationships of Geometric Shapes and Their Applications

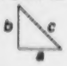
Concepts	Explanations and Examples
	• Perimeter, area, circumference, and volume can be calculated as follows: – *Perimeter* is the distance around a figure; to find the perimeter, add the lengths of the sides. – *Area* is the amount of space enclosed by a polygon. Rectangle: $A = lw$ Square: $A = s^2$ Triangle: $A = 1/2bh$ Parallelogram: $A = bh$ – *Circumference* is the distance around a circle. $C = \pi d$ $C = 2\pi r$ – *Volume* is the amount of space occupied by a three-dimensional object. Rectangular Prism: $V = lwh$ Cylinder: $V = \pi r^2 h$ **Example** • It is important that students recognize when to use appropriate formulas and be able to locate and apply formulas correctly. Perimeter and surface area computations are required to determine the amount and cost of materials in projects such as wallpapering or painting a room, purchasing and installing floor covering, painting a building exterior, planning a pattern layout, and planning a commercial display. Area (generally square footage) is directly related to energy needs and costs, housing costs, space requirements for child care centers, and the cost of leasing commercial space in a business.
Apply geometric properties to a variety of situations and nonroutine problems.	**Explanation** • *Similarity* is being the same shape but not necessarily the same size. *Congruence* is being identical in shape and size. *Symmetry* is having congruent halves; if folded on a line of symmetry, both halves match exactly and are reflections of one another. These basic geometric properties form the basis of many geometric theorems and applications, such as constructing congruent figures, making and interpreting scale drawings, and determining distances when direct measurement is not possible. A commonly used geometric theorem is the Pythagorean theorem, which states that in a right triangle, the square of the length of the hypotenuse (the longest side, opposite the right angle) equals the sum of the squares of the other two sides. The theorem is represented by the formula $a^2 + b^2 = c^2$. 

Table 4 – continued

Understand Properties and Relationships of Geometric Shapes and Their Applications	
Concepts	**Explanations and Examples**
	Example • Properties of similarity, congruence, and symmetry are utilized in textile design, interior decorating, floral arrangement, and housing design and construction. The Pythagorean theorem can be used to find an unknown length when lengths of two of the three sides of a right triangle are known. Surveying, engineering, and astronomy are examples of career areas built on triangle measure, or trigonometry. Have students interview mathematics teachers to find applications of geometry and trigonometry in home economics courses or related careers. Invite a math teacher to teach a lesson relating geometric principles to a specific area such as housing design and construction.

Table 4 – continued

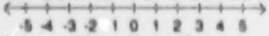
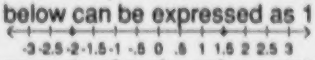
Practice Algebraic Concepts and Skills	
Concepts	**Explanations and Examples**
Classify real numbers as members of the appropriate subset.	**Explanation** - Numbers may be classified as integral, rational, or irrational. An *integer* is one of the set of whole numbers or their opposites. A *rational number* is any number that can be written as a fraction, where the numerator and denominator are integers and the denominator ≠ 0. An *irrational number* is a number that cannot be expressed exactly as a ratio of two integers; an example is the value of π, which is 3.14159265… and can extend to an infinite number of places. **Example** - Algebra is one of many problem-solving strategies available to students, and home economics content contains opportunities for application. Examples include financial planning and record keeping; credit costs; savings, investment, and insurance; analysis of nutritional adequacy and food portion computations; financial costs of health care; housing costs; marketing and display preparation; and determination of product costs. When leading students to problem-solve, use the vocabulary students learn in math classes; this helps students transfer learning, recognize the relevance of one subject to another, and build mathematics competence. Refer to whole numbers as integers and to numbers containing fractions or decimals as rational numbers.
Identify and use properties of real numbers.	**Explanation** - Relationships between numbers are depicted on the number line, on which each number is a coordinate of one point. The number zero is called the origin. Numbers to the right of zero are positive numbers, and numbers to the left of zero are negative numbers.  Given two numbers on the number line, the number lying to the right is the larger or greater of the two; the number to the left is the smaller or lesser. The relationship between the two number coordinates below can be expressed as 1.5 > -2, or -2 < 1.5.  The density property of real numbers states that between every two real numbers there exists another real number. On the number line above, the coordinates are graphed in intervals of 0.5; however, many other numbers exist between the coordinates, such as 0.6, 0.75, and 0.875.

Table 5

Practice Algebraic Concepts and Skills

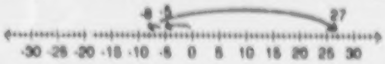
Concepts	Explanations and Examples
	Example • Real numbers and their properties form the basis of algebraic theorems. The number line can be used to explain the properties of and relationships between numbers and to depict relationships between items represented by the numbers. Students who have more advanced understanding can visualize mathematical relationships to a great extent; students lacking this understanding will find the number line useful in picturing numerical properties and relationships, especially when negative numbers are involved. If, for example, a bank account is \$5 overdrawn, less a \$3 service charge, and \$35 is deposited, what is the balance? The problem can be stated by the expression -5 - 3 + 35. A student proficient in working with negative numbers can easily *evaluate* (find the value of) the expression. A student confused by the negative numbers might find picturing the expression on the number line helpful in understanding and solving the problem. 
Investigate and use the order of operations.	**Explanation** • The *order of operations* is a set of rules used to simplify expressions that contain more than one operation. The rules are summarized as follows: – Always do operations within parentheses first. If there are no parentheses, continue as follows: 1) Simplify exponents. 2) Multiply or divide from left to right. 3) Add or subtract from left to right. – Evaluate the expression 35 ÷ (3 + 2^2) + 8. 35 ÷ (3 + 4) + 8 (Simplify exponents.) 35 ÷ 7 + 8 (Do operations within parentheses.) 5 + 8 (Multiply or divide from left to right.) 13 (Add or subtract from left to right.) **Example** • Look for opportunities to reinforce order of operations in solving problems in home economics. Examples of applications include financial and budgeting concepts, wage and earning computations, and food portion planning.

Table 5 – continued

Practice Algebraic Concepts and Skills	
Concepts	**Explanations and Examples**
	For example, Jamie employs three employees in his small interior design business and plans to hire two more. He wants to provide life insurance for his employees. The monthly cost is $4 per unit, and Jamie wants to know the cost of five units for each employee. The cost can be figured by evaluating the following expression: 3 employees + 2 employees x ($4 per unit x 5 units) 3 + 2 x ($4 x 5) 3 + 2 x $20 5 x $20 $100 Similar problems can be solved without referring to such concepts as order of operations, but doing so builds the connection between home economics and mathematics and strengthens both areas.
Write and evaluate linear expressions from verbal descriptions.	**Explanation** • In an algebraic expression, variables, numbers, and symbols represent words. For example, the sum of 5 and x decreased by 6 becomes $(5 + x) - 6$ in an algebraic expression. **Example** • The use of *variables* (letters or symbols that represent unspecified numbers) provides students with a useful problem-solving strategy. When students are confronted with word problems, encourage them to restate the problems in algebraic form, letting a variable stand for the unknown. For example, if 18% annual interest is charged on a credit card balance, monthly interest is 18% + 12 = 1.5%. Let x stand for the balance; monthly interest (I) for varying amounts can be computed by the expression $I = 0.015x$.

Table 5 – continued

Practice Algebraic Concepts and Skills	
Concepts	**Explanations and Examples**
Use the properties of equality in the equation-solving process.	**Explanation** • An *equation* is a number sentence that expresses the relation of equality between two expressions, using the = symbol. *Properties of equality* are rules used to simplify and evaluate algebraic equations. Properties of equality are as follows: – *addition property* When the same number is added to both sides of an equation, the sides remain equal. If $x = y$, then $x + 4 = y + 4$. – *subtraction property* When the same number is subtracted from both sides of an equation, the sides remain equal. If $x = y$, then $x - 6 = y - 6$. – *multiplication property* Both sides of an equation remain equal when multiplied by the same number. If $x = y$, then $3x = 3y$. – *division property* Both sides of an equation remain equal when divided by the same number. If $x = y$, then $x/4 = y/4$. – *commutative property* For all numbers x, y, and z, $x + y = y + x$, and $xy = yx$. – *associative property* For all numbers x, y, and z, $x + (y + z) = (x + y) + z$, and $x(yz) = (xy)z$. – *distributive property* For all numbers x, y, and z, $x(y + z) = xy + xz$, and $(x + y)z = xz + yz$. **Example** • Application of the properties enables students to employ algebraic equations and inequalities as a problem-solving strategy. When students express problems in the form of algebraic equations, refer to the properties of equality when evaluating the expressions. Note that expressions are simplified by performing inverse operations; division operations undo multiplication operations, and subtraction operations undo addition operations. – $8x = 56$ $8x + 8 = 56 + 8$ (division property) $x = 7$ – $(5 + x) - 6 = 4$ $(5 + x) - 6 + 6 = 4 + 6$ (addition property) $5 + x - 5 = 10 - 5$ (subtraction property) $x = 5$

Table 5 – continued

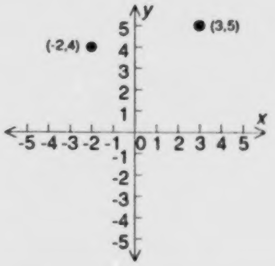
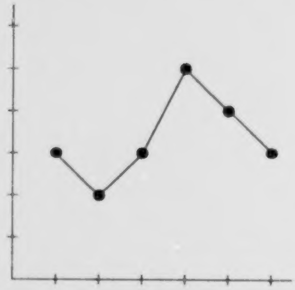
Practice Algebraic Concepts and Skills	
Concepts	**Explanations and Examples**
Determine the solutions to problem situations by writing and solving linear one-variable equations and inequalities.	**Example** - Provide opportunities for students to write and solve equations for finding solutions to problems involving cost comparisons, sales figures, recipe adaptation, energy use, prices, or discounts. For example, a punch recipe requires three cups of ginger ale for every two cups of cranberry juice. How many cups of each ingredient are needed to make 125 cups of the punch mixture? 1) Write the equation. If $3n$ = number of cups of ginger ale and $2n$ = number of cups of cranberry juice, the equation is stated $3n + 2n = 125$. 2) Solve the equation. $3n + 2n = 125$ $5n = 125$ (combine like terms) $5n \div 5 = 125 \div 5$ (division property) $n = 25$ 3) $3n = 75$ cups of ginger ale, and $2n = 50$ cups of cranberry juice.
Graph and interpret a set of ordered pairs of numbers.	**Explanation** - An *ordered pair of numbers* is a pair of numbers, called *coordinates*, listed in specified order. Coordinates can be graphed on two number lines, called *axes*. The horizontal number line is called the *x-axis*, and the vertical number line is the *y-axis*. The coordinates (3, 5) and (-2, 4) are graphed below. Note that the first number is always the x-coordinate, and the second is the y-coordinate. 

Table 5 – continued

<table>
<tr><th colspan="2">Practice Algebraic Concepts and Skills</th></tr>
<tr><th>Concepts</th><th>Explanations and Examples</th></tr>
<tr><td></td><td>

Example

- The concept of coordinate graphing is used in finding locations on maps. For example, the coordinate (C,3) might pinpoint the location of a city. Plotting coordinates that represent data collected for different groups or over a period of time depicts relationships and changes in the data. Connecting the graphed points with a line forms a line graph, such as the one shown below. The graph might represent the temperature of an ill person taken at one hour intervals, the height or weight of a child recorded yearly, the cost of an item over the last ten years, or quarterly profits of a small business.



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Graph linear equations or formulas.

</td><td>

Explanation

- An equation or formula can be graphed as follows:
  1) Complete a table of values that will satisfy the equation.
  2) Graph the resulting coordinates to determine the shape of the graph.
  3) Connect the points to construct the graph.

  For example, let $W = 5y$.

<table>
<tr><th>y</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>W</td><td>5</td><td>10</td><td>15</td><td>?</td><td>?</td><td>?</td></tr>
</table>

Example

- Graphing equations helps students visualize how changes in the number value of one variable affect the value of another. In the equation above, suppose W stands for wages at $5 per hour and y represents the number of hours worked. The graph on page 27 shows that wages for one hour total $5 and the wages for five hours total $25.

</td></tr>
</table>

Table 5 – continued

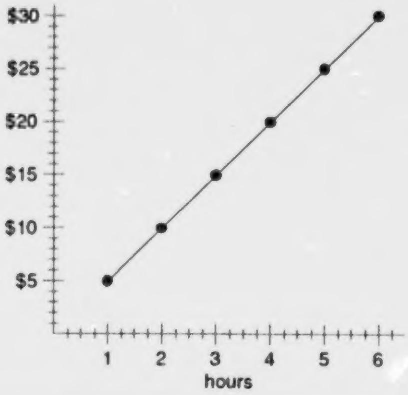
<table>
<tr><th colspan="2">Practice Algebraic Concepts and Skills</th></tr>
<tr><th>Concepts</th><th>Explanations and Examples</th></tr>
<tr><td></td><td>Graphs can effectively depict the cost for varying amounts of any item, such as food, clothing, hours of child care, and energy usage. A graph showing the amount of interest earned at 7.5% on various dollar amounts can clearly show students the dollar benefit of opening savings accounts. Note that the graph of a linear equation, if extended, will depict all possible values. Wages earned in 2 hours and 45 minutes can be estimated by locating the point where the 2.75 hour coordinate appears to intersect the graphed line and reading across to the corresponding wages coordinate ($13.75).

 </td></tr>
</table>

Table 5 – continued

Use Probability and Statistics to Collect and Interpret Data	
Concepts	**Explanations and Examples**
Use counting methods and factorials to solve problems.	**Explanation** • *Probability* is the likelihood of an event occurring; it is expressed by the ratio of designated or successful outcomes to the total number of outcomes possible. Probability can be expressed by the ratio *s/n*. There are several ways to count all possible outcomes, including the following: – List all possible outcomes. – Draw a tree diagram depicting possible outcomes. – Multiply to determine possible outcomes. If two operations are performed in sequence, the total possible outcomes equals the number of possible outcomes for the first operation multiplied by the number of possible outcomes for the second. **Example** • Teaching Aid 3, Outcomes and Probability, depicts methods for determining possible outcomes. Similar learning and evaluation experiences can be developed to depict possibilities for grouping, such as grouping students in a lab, children playing a game, or food items.
Calculate the probability of simple and compound events.	**Explanation** • *Simple-event probability* is the likelihood of one event occurring; *compound-event probability* is the likelihood of two or more events occurring. **Example** • If a person has ten coins in his or her pocket and three of them are quarters, when he or she reaches into the pocket for a coin, the probability that a quarter will be chosen is 3:10 (or 3/10, 0.33, or 33%). Once data is collected and organized, the probability of a specific occurrence may be calculated as part of the interpretation process. The study of heredity provides opportunities to apply probability principles.
Collect, organize, and interpret data.	**Example** • Have students survey groups such as parents or classmates, organize the collected data, and interpret the data. Explain that *statistics* are numerical data, or the process of collecting, organizing, and interpreting that data. Discuss how organization or classification of items facilitates understanding, interpreting, and analyzing of data.

Table 6

Use Probability and Statistics to Collect and Interpret Data	
Concepts	**Explanations and Examples**
Construct charts, graphs, and frequency tables from given data.	**Explanation** • A *chart* organizes and lists information in tabular form. A *graph* depicts numerical data. Types of graphs include picture graphs, line graphs, bar graphs, and circle graphs. A *frequency table* shows the number of occurrences per data group. **Example** • Have students organize collected data in charts, graphs, and frequency tables such as shown on Teaching Aid 4, Frequency Tables, Charts, and Graphs. Students may construct picture graphs depicting the financial impact of children on the family, line graphs showing the rise in world population over the last 200 years, or pie graphs illustrating the nutritional components of food items. Review lesson plans to identify other information that might easily be organized in graphic form.
Find measures of central tendency (mean, median, and mode) and use each appropriately.	**Explanation** • The *mean* is the average of a set of numbers. The *median* is the middle number of an ordered set of numbers (if there are two middle numbers, the average of the two is taken). The *mode* is the item repeated most often in a set of numbers. Mean, median, and mode all measure the *central tendency* of a set of data or the tendency of data to cluster around the midpoint. Another statistical measure is variability, which is measured by the range of a set of numbers. The *range* is the difference between the highest and the lowest numbers in a set of numbers. **Example** • If the weights of nine children are 31, 35, 37, 37, 39, 42, 43, 48, and 51 pounds, the mean weight is 40.3 pounds, the median weight is 39 pounds, and the mode is 37 pounds. Have students compute and analyze the mean, median, and mode of items such as the following: – prices of items compared at different locations – wages in various career fields – weights and heights of children – test scores – calorie content of different food items – unit sales in a business for one quarter – hours slept per day for one month

Table 6 – continued

Use Probability and Statistics to Collect and Interpret Data	
Concepts	**Explanations and Examples**
Make predictions and engage in problem-solving applications using charts, graphs, frequency tables, measures of central tendency, and probability calculations.	**Explanation** • Two key reasons for conducting statistical analyses are to predict future events and solve real-life problems. Studying organized data and calculating probability enable one to use past occurrences and trends as a basis for future predictions. **Example** • Data regarding previous consumption and purchase of food items enables grocery stores and restaurants to estimate quantities to purchase and prepare. Physicians use children's weight and height charts to predict adult weights and heights. Statistical analyses can be used to make cost predictions, sales projections, predictions regarding population trends, and predictions of hereditary characteristics. Assign students similar projects requiring research, predictions, and problem-solving.

Table 6 – continued

Solve Problems by Selecting and Matching Strategies to Given Situations

Concepts	Explanations and Examples
Estimate answers before solving and determine the reasonableness of answers after solving problems.	**Explanation** • Techniques of estimating include rounding and applying mental computation. Rounding refers to expressing a figure as a round number. For example, 24.7 is rounded to 25. **Example** • Look for experiences where exact math computations are not necessary and have students practice estimating answers. Have students estimate the total cost of an assortment of infant supplies, the cost of selected menu items from a cafeteria, or the cost of several children's garments from a department store. Discuss why it is often helpful to be able to estimate and explain situations in which it is not necessary to perform exact computations. Discuss how verifying the reasonableness of an answer can eliminate costly errors.
Use a wide variety of problem-solving strategies.	**Explanation** • Exact steps of problem-solving processes vary in different textbooks. A common method of problem solving is as follows: – Analyze the problem. – Make a plan; select a problem-solving strategy. – Estimate the solution. – Solve the problem using the selected strategy. – Verify the solution; determine if it fulfills the requirements of the original problem and is reasonable in light of the estimation. **Example** • Problem-solving strategies include the mathematics processes previously discussed: computations of addition, subtraction, multiplication, and division; ratio, proportion, and percent; geometry and trigonometry; algebra; probability and statistics; and charts, graphs, and tables. An essential component of mathematics competence is recognizing when to employ specific strategies. Integration of mathematics principles in home economics courses provides students additional practice in selecting and applying problem-solving strategies in nonroutine and meaningful ways. Encourage students to follow steps such as those listed above when encountering problems and have them verbalize how they selected and employed mathematics strategies to solve problems.

Table 7

Solve Problems by Selecting and Matching Strategies to Given Situations	
Concepts	**Explanations and Examples**
Use calculators and/or computers to solve problems.	**Example** • Students need to develop proficiency in the use of calculators and computers since these tools are commonly used in today's technological society. Have students use calculators to perform appropriate computations in the classroom or in completing outside assignments as often as possible. Keep calculators available for students to use. Have students use computers to solve problems or complete assignments, perhaps in conjunction with a computer laboratory course.

Table 7 – continued

Apply Concepts and Skills Involving Personal Finance	
Concepts	**Explanations and Examples**
Compute income and wages.	**Example** • Given wage rate and time worked, have students compute earnings. If wage is $4.85 per hour and fifteen hours are worked in a week, what are total weekly earnings? Extend computations to figure monthly or yearly income. Include computations relating to overtime, piecework, or commission. If Leah earns $1.05 per unit for the first ten monograms applied each day and $1.15 per unit for additional applications, what does she earn on a day when she applies thirteen monograms? Have students research various methods of computing wages used by local businesses or interview students who have been employed to find out about the systems used to pay their wages.
Interpret payroll deductions such as social security, income tax, retirement, insurance, and savings.	**Example** • Have students complete learning and evaluation experiences such as the following to gain a better understanding of payroll deductions: – Look at examples of pay stubs and discuss the various deductions. – Interview several adults and students who are employed to find out what deductions are commonly withheld from wages. – Research the percentages withheld for various deductions and compute dollar amounts given gross wages. – Discuss cost versus benefits of deductions.
Compare costs and savings on consumer purchases.	**Example** • Discuss markup and discount of products. Have students compute dollar amounts of percentage markups or discounts and give resulting prices or costs. Have students compute and compare unit prices of items from different sources or of differing brands.
Determine taxes, including sales, excise, and hidden taxes.	**Example** • Have students research local, state, and federal rates of sales, excise, and hidden taxes; organize findings in a chart, table, or graph; and report findings orally or in writing. Have students use the given rates to compute and analyze the dollar amounts of taxes on specified products. Students may also calculate sales tax on sales of fund-raising items. Discuss the importance of considering the amount of taxes when budgeting or figuring total costs of items.

Table 8

Apply Concepts and Skills Involving Personal Finance	
Concepts	**Explanations and Examples**
Develop and maintain a personal budget.	**Example** • Students may budget housing, auto, entertainment, or other personal expenses over which they have some control. Have students prepare budgets, maintain spending records, and compare budgeted amounts to actual expenses. Evaluate examples of budgets and suggest possible improvements. Discuss methods of budgeting, based on student research and interviews of persons who have utilized budgets in family, organization, or business planning. New technologies that simplify budgeting such as computer programs and budget formats should be included.
Open and maintain simulated checking and savings accounts, filling out forms, doing computations, and balancing statements.	**Example** • Have students compare different types of checking and savings accounts and discuss the differences in interest paid or charges assessed. Students should understand forms and procedures for opening checking and savings accounts. Students may visit banks or a banker may share information with the class. Have students practice writing checks correctly, keeping records of checks and deposits, and reconciling monthly bank statements.

Table 8 – continued

Fundamental Principles of Science

Introduction

Science can be defined as a body of knowledge about nature. Science is also the process of obtaining, investigating, and manipulating that knowledge. Science, like mathematics, is a way of thinking.

As a body of knowledge, science has been organized into numerous specific content disciplines such as anthropology, astronomy, biology, and chemistry. Facts, concepts, and theories within each discipline have been developed over the years as persons have observed natural phenomena, organized data into logical groupings, and interpreted observations and data through scientific methods. As knowledge is added to science, new disciplines emerge and existing disciplines change. For example, nuclear physics is a relatively new scientific discipline based on knowledge that was nonexistent less than a century ago.

Scientific knowledge amassed through the years has been organized into a body of concepts, theories, and laws. The accumulation and organization of this knowledge has enabled each generation to build on the knowledge of its predecessors, providing new insights into the physical, biological, psychological, and social worlds. These new insights have contributed to advancing the quality of life throughout history.

The processes of scientific inquiry and reasoning have enabled individuals to obtain, manipulate, and investigate data. *Inquiry* is investigation aimed at finding truth or knowledge. Investigation may take the form of observation, experiment, research, or other methods of discovery. *Reasoning* is the process of forming inferences or conclusions based on knowledge uncovered through scientific inquiry; it is logical thinking. These scientific processes have led to discovery of patterns and theories that broaden understanding of our world and make predictions of future outcomes possible.

Science and Technology

The terms *science* and *technology* are often used conjunctively. *Technology* is the application of scientific knowledge to benefit society and improve quality of life. Technology creates means for extending human abilities; the shaping of simple tools led to development of the first human cultures. Technology has enabled humans to design and shape many parts of their world.

Technology and science have a reciprocal relationship. Technological advances foster the growth of science knowledge; scientific discoveries lead to expanded technologies. As discussed in the introduction of this book, technology has greatly contributed to the explosion of information in our society, including vast amounts of new scientific information. Since science and technology both greatly impact society, competence in both is essential to productive functioning of individuals and has become an important goal of education.

Science Competence

Professional groups and educators agree that science competence is essential to the success and well-being of individuals and of society as a whole. They are in agreement that students need higher levels of science skills in today's technological society than ever before, and they share concern that American youth fall below youth in many other nations in assessments of science competence. There is also emerging agreement regarding the instructional reforms needed to increase science skill levels of students.

Science instruction in the past has placed great emphasis on memorizing many facts and concepts about the scientific world. However, the body of scientific knowledge has become so great that it is possible for students to master only a portion of current scientific concepts and principles. New scientific knowledge is increasing at an accelerated rate unprecedented in the history of humankind. Students can easily become overloaded with memorization of facts, which causes frustration and lessens motivation to learn science. In addition, many facts are superseded or become obsolete in a matter of years.

Proponents of science reform urge the development of a science curriculum that deemphasizes rote memorization and encourages mastery of science process skills. Emphasis should be placed on methods of scientific inquiry and reasoning with ample opportunities provided for students to practice science skills and apply scientific knowledge to everyday situations. Natural curiosity and excitement about exploring the natural and man-made world should be fostered throughout the curriculum.

It is recommended that content be taught more selectively, teaching fewer science concepts more thoroughly in a thematic approach. A thematic approach focuses on central, recurring themes or ideas that cut across scientific discipline boundaries. For example, energy is a theme that encompasses the physical, biological, and geological sciences.

Thematic instruction allows students to perceive the relationship of the various scientific disciplines and to transfer learning from one discipline to another. A more integrative approach to teaching content is thus recommended, with boundaries softened and connections between the disciplines strengthened.

The following principles summarize current recommendations regarding science instruction:

- Knowledge content should be selective, focussing on concepts and principles deemed most essential to personal health, productivity, and adaptability and to social and environmental responsibility. Themes, or main ideas, interconnect the disciplines and foster student transfer of learning. Students should be taught to access appropriate resources for additional or expanded scientific knowledge.
- Science is best learned through hands-on, manipulative, and sensory experiences that build on natural curiosity and personal frames of reference. Manipulative skills and safe laboratory practices must be reinforced to build science competence.
- Emphasis should be placed on mastering science process skills. Students gain skill in scientific inquiry and reasoning through practice. If students are comfortable with the process and have gained confidence in their abilities, they should be able to use data from specific science disciplines to seek knowledge and solve problems. As new infor-mation is discovered, it can be adapted to this framework.
- Science application to everyday life is of utmost importance. Students should be given opportunities to apply science knowledge and skills to personal and social decisions. Science and technology provide society with many conveniences and positive advances, but the inherent side effects of rapidly advancing science and technology must be recognized and addressed. Students must be able to think critically in order to make responsible decisions based on fact and objective analysis of data, not opinion, and to recognize the consequences of their decisions and actions.

> "Thematic instruction allows students to perceive the relationship of the various scientific disciplines and to transfer learning from one discipline to another."

Principles of Science

Science principles presented in *Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum* are based on the science essential elements approved by the Texas State Board of Education and a review of literature. Table 9 summarizes science concepts and skills in accordance with the instructional recommendations previously discussed.

Science Knowledge

In order to understand and participate productively in their world, students need a knowledge base of science facts, concepts, and theories. Elementary students are taught a balance of conceptual knowledge from the life, earth/space, and physical sciences. The secondary education curriculum strengthens science skills proficiency while offering students opportunities to explore a variety of science disciplines in more depth, such as biology, chemistry, and physics.

Tables 10, 11, and 12 list key concepts of life, earth, and physical sciences that are especially relevant to the discipline of home economics. The concepts presented by no means represent all essential science concepts. Because so many key concepts exist in so many varied disciplines, conceptual content must be selectively individualized. Science textbooks and current reference books should be consulted in order to broaden and deepen conceptual focus and to meet student or course needs.

The classification of concepts into the three categories (life, earth, and physical science) is arbitrary, for organizational purposes. Many topics overlap the three divisions and can easily be taught thematically. For example, a study of energy could involve cellular energy related to nutrition, chemical energy released by leavening agents in food science, and electrical energy requirements of appliances.

Manipulative Laboratory Skills

Laboratory experiences give students first-hand opportunities to explore and discover independently. Hands-on laboratory activities develop manipulative and process skills while simultaneously strengthening conceptual framework. First-hand experience facilitates learning transfer to other areas of life.

Teaching students to recognize, value, and practice safety is a fundamental goal of laboratory learning experiences. Safety in the laboratory setting safeguards the well-being of participants and reduces legal risks for the teacher or school. Safe use of equipment and supplies is essential to lifelong health as individuals handle materials and equipment in household, work, and other everyday activities.

Laboratory experiences also provide opportunities for students to develop correct investigative procedures and technical skills such as hand/eye coordination, measurement techniques, and manipulation of various materials. Students learn to choose the equipment and methods most appropriate for given tasks.

Table 13 provides suggestions for applying manipulative laboratory skills in home economics courses.

Science Process Skills

The science process encompasses the means humans have developed for ordering, shaping, and exploring their world. Over time, systematic methods have been developed to observe, discover, classify, measure, question, investigate, and predict natural phenomena. Terms such as *scientific inquiry*, *scientific method*, *rational thinking*, and *critical thinking* reflect sets of actions and attitudes central to scientific endeavor.

One such systemized process is the *scientific method*, an investigative procedure in which phenomena are observed, hypotheses are formulated and experimentally tested, and conclusions are drawn. After a hypothesis has been extensively supported by testing and abundant data, it may be generalized into a *theory*. Those theories most accepted and proven are called *scientific laws*. As students practice following the scientific method, they gain skill in drawing logical inferences, predicting outcomes, and formulating their own generalized statements.

While following steps in the scientific method to test and discover theories and laws, scientists observe certain rules of attitude and behavior. Curiosity and openness to new ideas are essential to science; openness, however, is balanced by skepticism and healthy questioning. Observations must be objective and honest, with data recorded clearly and carefully.

Science is inherently experimental. It is characterized by careful methods and logical reasoning, which produce accurate and unbiased results. As science and technology present complex options for societal application, ethical values and a sense of responsibility acquire increased significance for students of science.

Science process skills are more extensively developed in Table 14, with emphasis given to employing science skills within the home economics discipline.

Science Application

While the study of science can be fun and exciting and help satisfy natural human curiosity, the ultimate purpose is to benefit individuals and society through application. Science provides both a conceptual basis and process for solving complex problems and making decisions on individual and corporate levels. Table 15 includes principles for applying science within home economics course areas.

Reinforcing Science Principles in Home Economics

Science is closely related to home economics because home economics itself is an applied science discipline. Food science and nutrition are essentially built on the conceptual framework of the life and physical sciences, with strong emphasis on chemistry. Child development, family life, and family health draw upon behavioral and biological sciences. Principles of life and physical science are integral to the study of textiles and apparel. Housing and management incorporate such life science concepts as environmental influences and ecology. Laboratory experiences in various home economics content areas build manipulative and process skills and attitudes in science.

Tables 9 through 15 are intended to generate ideas interrelating science and home economics. Specific learning and evaluation experiences are further developed for each home economics content area in the "Learning and Evaluation Experiences" section of this book. Neither of these resources adequately covers the myriad of opportunities for reinforcing science principles in home economics. Each teacher is encouraged to creatively develop additional learning experiences tailored to individual student needs and course objectives and to collaborate with teachers in the science disciplines.

Science Concepts and Skills

Understand basic concepts of life science.
- Understand the basic structure and function of cells, including such concepts as cell theory, parts of cells, and cellular processes.
- Identify simple organisms and cite their effects on everyday life.
- Understand basic human body systems.
- Comprehend essential principles of development and heredity.
- Relate principles of health and disease to practices that promote good health.
- Understand essential principles of ecology.
- Identify practices that promote environmental balance.

Comprehend basic concepts of earth science.
- Relate weather and climate to housing needs, apparel requirements, health concerns, and production of food and textile products.
- Recognize how the earth's oceans provide valuable current and future resources.

Identify basic concepts of physical science.
- Grasp key concepts related to matter, including properties, states, and physical and chemical changes of matter.
- Differentiate between matter existing as elements, compounds, and mixtures.
- Identify acids, bases, and salts.
- Understand basic concepts of work and energy.
- Comprehend essential principles of heat and thermodynamics.
- Understand basic characteristics of waves.
- Apply principles of sound and sound control to the home and workplace.
- Gain an understanding of light and its properties.
- Understand basic principles of electricity.
- Explain the importance of energy resource conservation.

Develop manipulative laboratory skills.
- Demonstrate the safe use of equipment and supplies.
- Demonstrate correct investigative procedures and techniques.
- Understand the relationship of measurements and standards.

Apply science process skills.
- Use observation skills in acquiring data through the senses.
- Use classification skills in ordering and sequencing data and classifying biological organisms, objects, and events according to similarities and differences.
- Apply the scientific method in experimentally testing hypotheses and identify and manipulate the conditions of investigations, identifying the variables remaining constant, the variables being manipulated, and the variables responding in an investigation.
- Draw logical inferences, predict outcomes, and form generalized statements.
- Relate objects and events to other objects and events; transfer learning.
- Apply defined terms based on observations.
- Communicate oral and written data in appropriate form.

Apply science in daily life.
- Locate, evaluate, and utilize sources of scientific information.
- Use scientific information to solve problems and make responsible decisions for the benefit of the individual and society.
- Use rational and critical thinking skills as the basis for inferences and actions.

Table 9

Understand Basic Concepts of Life Science

Concepts	Explanations and Examples
Understand the basic structure and function of cells, including such concepts as cell theory, parts of cells, and cellular processes.	**Explanation** • A scientist named Robert Hooke discovered and gave the name *cells* to the microscopic units that make up living things in 1665 while looking at slices of cork through a microscope. Since that time, scientists have formulated the *cell theory,* which states that (1) all living things are made of cells, and (2) only living cells can reproduce other living cells. Although cells vary in size and shape, most cells have the following parts in common: – The *nucleus*, or center of the cell, is a central mass that directs the cell's activities. – *Cytoplasm* is a thick fluid that makes up most of the cell. Cellular activity occurs in the cytoplasm. – *Mitochondria* are small, usually rodlike structures that release energy from food entering the cell. – *Ribosomes* are minute, spherical particles that use energy to make protein. – *Vacuoles* are bubblelike storage areas for storing food, fluid, and waste. – The *cell membrane* is a lining that surrounds the cell and controls materials entering or leaving the cell. Cells perform many activities. Three of these activities are as follows: – *Diffusion* is the constant movement of molecules in solution from areas of greater concentration to areas of lesser concentration. Food, water, and wastes move in or out of cells through the process of diffusion. – *Osmosis* is the diffusion of water molecules through a cell's membrane. The process of osmosis maintains the proper water balance in a cell. – *Respiration* is the process of releasing energy from digested food combined with oxygen. *Fermentation* is another process by which some cells release energy without oxygen. **Example** • An understanding of cell structure and function relates to the study of health and disease and to the study of human growth and development. Have students research how various diseases disrupt the normal functioning of cell structure or processes. Discuss how basic needs of all organisms for food, water, oxygen, energy, temperature, and light are related to cellular activity; for example, oxygen is needed for cells to release energy from sugar in the process of respiration.

Table 10

Understand Basic Concepts of Life Science

Concepts	Explanations and Examples
	Note that *nutrition*, the ingestion and use of food by organisms, is a basic life activity performed in the cells. Demonstrate the process of diffusion by noting how odor, such as produced when cooking food, is actually the diffusion of gaseous molecules through the air.
Identify simple organisms and cite their effects on everyday life.	**Explanation** • Simple organisms include the following: – *Viruses* are microscopic particles that invade other cells. They consist of nucleic acid with a protein coat but contain no cell parts, and they reproduce only after they have entered another cell. Therefore, scientists disagree on the classification of viruses as living organisms, and viruses are not classified in any kingdom. – *Bacteria* are small, single-celled organisms in the Monera kingdom. Bacterial cells have no nucleus, and most bacteria cannot make their own food. They obtain food from other living or dead organisms. Because almost all material can be food for some type of bacteria, bacteria are quite prevalent. Bacteria can be harmful, causing food spoilage and disease, or they can be helpful, breaking down dead matter, aiding digestion in some animals, and enabling production of foods such as cheese, yogurt, and sauerkraut. – *Protists* are single-celled organisms that have cell nuclei. Some resemble plants by making their own food, and some are more similar to animals, ingesting food. Protists positively affect their environment by producing oxygen and providing food for other organisms. Certain protists have negative effects on the environment, causing diseases such as malaria, African sleeping sickness, and amebic dysentery. – *Fungi* are simple organisms that have cell walls like plants but lack chlorophyll and cannot make their own food. Fungi therefore obtain nutrients from other living things. Mold, mildew, mushrooms, and yeast are examples of fungi. **Example** • Have students research and discuss positive and negative effects of simple organisms on the health of adults and children, on food preservation and production, and on the environment. Several effects are discussed in the explanation of these concepts.

Table 10 – continued

Understand Basic Concepts of Life Science

Concepts	Explanations and Examples
	Have students identify practices that deter the growth of harmful organisms. Examples are as follows: – housing control of mold and mildew and cleanliness procedures that inhibit growth of bacteria or viruses – textiles and apparel effect of fungi on apparel products – family health first aid, cleanliness, and prevention of communicable diseases – food science and nutrition proper food handling and preservation
Understand basic human body systems.	**Explanation** • Cells are the basic unit structure of all living things, and all life activities are performed by cells. In *one-celled organisms*, a single cell must perform all life functions by itself. In *multi-celled organisms*, similar cells performing a special job are grouped into *tissues*. Tissues that work together to perform a specific function form *organs*, and organs that work together to carry on a major life function form *systems*. The human body is composed of the following systems that carry on basic life processes. – Digestive System *Digestion*, performed by the digestive system, is the process of breaking food down into materials that can be absorbed and used by body cells. Organs in the digestive system include the mouth, salivary glands, esophagus, stomach, small intestine, large intestine, gall bladder, pancreas, and liver. – Respiratory System *Respiration* is the release of energy from digested food. The respiratory system consists of the nose and mouth, respiratory passages, lungs, and diaphragm. When oxygen is delivered via the blood to the cells, it is combined with glucose in a chemical process that releases energy and produces wastes in the form of carbon dioxide and water. – Excretory System *Excretion* is the elimination of wastes from the body. The lungs, kidneys, and skin are organs that perform the excretion process. Carbon dioxide and water produced during respiration are exhaled through the lungs. Water, salt, and other wastes are excreted through the skin as sweat. The kidneys perform the main functions of excretion by filtering wastes from the blood and producing urine which is eliminated through the ureters, bladder, and urethra.

Table 10 – continued

Understand Basic Concepts of Life Science

Concepts	Explanations and Examples
	– Circulatory System The *circulatory system* transports materials in the blood to and from cells throughout the body. It consists of blood, the heart, and blood vessels. – Nervous System The *nervous system*, consisting of the brain, spinal cord, and sense organs, is the communications center of the body. Its functions include relaying messages, processing information, and regulating body activities. – Endocrine System The *endocrine system* controls and regulates body activities through production of chemicals called hormones. Organs in the human endocrine system include the pituitary glands, thyroid glands, parathyroid glands, adrenal glands, pancreas, and ovaries or testes. – Skeletal System Functions of support and movement are enabled by the skeletal and muscular systems of the body. The *skeletal system* consists of bones and joints that support and shape the body and permit movement. Skeletal muscles work with bones to produce movement. – Reproductive System The *reproductive system* enables the production of offspring. The testes are the male reproductive organs; ovaries are female reproductive organs. **Example** • Many opportunities exist for relating home economics content to human body systems. Health practices and nutritional habits affect various systems, and special diets and lifestyles may facilitate the functioning of systems and prevention of disease in both children and adults. Have students research how the use and abuse of drugs affects the central nervous system or how prolonged excess stress affects various organs and systems. Pregnancy, prenatal development, and aging are additional concepts for further research. Assist students in identifying choices regarding diet, drug abuse, exercise, rest, and preventive health care that contribute to healthy functioning of one's body systems.

Table 10 – continued

<table>
<tr><th colspan="2">Understand Basic Concepts of Life Science</th></tr>
<tr><th>Concepts</th><th>Explanations and Examples</th></tr>
<tr>
<td>Comprehend essential principles of development and heredity.</td>
<td>
Explanation

<i>Heredity</i> is the passing of traits from parents to offspring; the study of heredity is called <i>genetics.</i> Scientific knowledge of genetics is based on the work of Gregor Mendel, who first researched heredity in experiments with peas. Scientific research built on Mendel's observations has uncovered the following genetic principlas:

– Each trait, or characteristic, has two heredity factors called <i>genes</i>, which are carried on chromosomes. <i>Chromosomes</i> are structures inside the nucleus of a cell that are made up of <i>DNA</i> (<i>deoxyribonucleic acid</i>), which directs cellular activities and carries heredity blueprints.
– When a sex cell is formed in the reproduction process, the two genes separate.
– The offspring, formed by the union of a male and female sex cell, receives one gene for each trait from each parent.
– The two genes for each trait may be identical, resulting in a <i>pure cell</i> or organism; if the genes are different, the cell is <i>hybrid</i> for that trait.
– Genes for certain traits are <i>dominant</i>, or stronger, while genes for other traits are <i>recessive</i>, or weaker. When a dominant gene is paired with a recessive gene, the offspring bears the trait of the dominant gene. When genes from two hybrids are crossed, traits of the offspring may differ from those of either parent. Recessive traits appear in 25% of the offspring when hybrids are crossed.
– Results of possible gene combinations can be illustrated in a Punnett square as shown below. The male genes are on top of the square and the female genes are on the left side. In this illustration, the dominant gene is tall (T) and the recessive gene is short (t). The resulting combinations indicate a 25% probability that the offspring will be short.

<table>
<tr><th></th><th></th><th colspan="2">Male Genes</th></tr>
<tr><th></th><th></th><th>t</th><th>t</th></tr>
<tr><th>Female Genes</th><th>T</th><td>Tt</td><td>Tt</td></tr>
<tr><th></th><th>T</th><td>Tt</td><td>Tt</td></tr>
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Table 10 – continued

Understand Basic Concepts of Life Science

Concepts	Explanations and Examples
	Example • Have students use Punnett squares to chart the possible occurrence of such traits as eye color and blood type. Discussion of genetic probability provides opportunity to apply mathematical principles of probability, reviewed on page 28. Principles of heredity may be related to prediction of a child's characteristics given the traits of the parents, including conditions such as color blindness and genetically transferred disease. Have students explore examples of genetic engineering, used to create improved plant and animal food products and textile fibers.
Relate principles of health and disease to practices that promote good health.	**Explanation** • *Disease* is a condition in which an organism does not function properly. Diseases may be noninfectious or infectious. *Noninfectious diseases*, such as the following, cannot spread from one person to another: – *malnutrition*, or lack of proper nutrition – genetic diseases that are passed by parents to offspring, such as phenylketonuria (PKU), sickle cell anemia, and Huntington's disease – chemicals or other harmful substances introduced into the body, such as harmful drugs or polluted air – *cancer*, a disease in which cell function and division are out of control, causing invasion of and interference with normal functioning of body systems – diseases in which an organ or system ceases to function properly, such as heart disease, that may be related to lifestyle *Infectious diseases* spread from one person to another through microscopic organisms or viruses that cause disease. *Infection* is the existing condition when tissue is being invaded by a disease-causing microorganisms such as the following: – Viruses infect the body and cause tissue damage and chemical changes in infected cells. The common cold, chicken pox, measles, influenza, polio, rabies, and fever blisters are caused by viruses. – Bacteria either directly destroy living cells or produce *toxins*, poisonous substances that damage cells and tissues. Bacterial diseases include strep throat, diphtheria, syphilis, tetanus, tuberculosis, acne, and boils. *Antibiotics* are substances produced by living organisms that are often used to combat bacterial disease.

Table 10 – continued

Understand Basic Concepts of Life Science	
Concepts	**Explanations and Examples**
	– Fungi can cause such diseases as ringworm and athlete's foot. – Protozoa can cause dysentery, malaria, and sleeping sickness. The human immune system is the body's natural defense mechanism against disease. The skin and mucus membranes of the respiratory system protect the body from entry of dirt and germs. Once germs enter the body, white blood cells fight the invading microorganisms by directly attacking them or by producing *antibodies*, chemicals that fight specific antigens. *Antigens* are invading microorganisms or particles that trigger antibody production. Once antibodies are produced, the body develops *immunity*, resistance to a disease. Immunity may result from contracting a disease (*natural immunity*) or from receiving a vaccine that prevents disease (*acquired immunity*). *Vaccination* is the injection of dead or weakened antigen into an organism for the purpose of imparting immunity. **Example** • Principles of health and disease relate to many home economics content areas. Have students studying family and individual health research infectious and noninfectious diseases and report on contributing factors and means of prevention. Discuss how stress, poor diet, or poor hygiene affect health and disease. Have students in parenting and child development classes research preventive medical care, relating vaccines and immunizations to immunity principles and discussing the role of antibiotics and importance of proper administration. Cleanliness and proper handling of food products are health concerns in hospitality, institutional maintenance, and food science; even proper laundering procedures relate to prevention of infectious diseases. Most importantly, have students explain how knowledge of health and disease principles can be used to promote good health.
Understand essential principles of ecology.	**Explanation** • The life of every organism depends on the nonliving environment and other organisms that surround it. *Ecology* is the study of the relationships that exist between living things within their environment. Organisms of a particular species inhabiting the same area form a *population*; interacting populations living together make up a *community*.

Table 10 – continued

Understand Basic Concepts of Life Science	
Concepts	**Explanations and Examples**
	Populations interact through varying relationships; of primary importance are food relationships. Populations can be classified as producers, consumers, or decomposers, according to their food sources. *Producers* make their own food; plants and some bacteria make up the base of the food chain by transforming solar energy to food through the process of photosynthesis. *Consumers*, unable to make their own food, consume other plants or animals. *Decomposers* consume the remains of dead organisms. Decomposers such as fungi and bacteria break dead matter into simpler elements to be used by other organisms. An *ecosystem* is a specific group of organisms and their nonliving environment. An example of an ecosystem is a lake with living organisms like fish, frogs, and plants and such nonliving components as water, sunlight, mud, and temperature. **Example** • Provide learning experiences that cause students to relate the food chain and food web to the economy and the world food supply; a good overview is provided in chapter 1 of *Advanced Food Science and Nutrition*, available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas. Discuss relationships existing within various human communities and among the world population as a whole; such relationships affect housing, management, and food science and nutrition. For example, disruption of the food chain by drought in one country can cause a major disruption of the food chain worldwide, affecting various communities. Lead students to brainstorm to identify home economics careers related to ecology; careers may relate to current and future food supply, including new forms and sources of food.
Identify practices that promote environmental balance.	**Explanation** • As the human population continues to increase, maintenance of a balanced environment becomes more challenging. Certain resources used by the human population are *renewable*, meaning they can be replaced at about the same rate they are used. Other resources are *nonrenewable* and cannot be reused, often taking centuries to be replaced. An expanding population demands *conservation*, the wise use and care of natural resources.

Table 10 – continued

Understand Basic Concepts of Life Science	
Concepts	**Explanations and Examples**
	Proper handling of wastes is also critical to avoid pollution of resources. *Pollution* is the introduction of contaminating substances into the environment. Types of pollution include water, air, noise, and land. Practices that foster recycling of natural resources help to dispose of waste, avoid pollution, and conserve natural resources. **Example** • Conservation and waste management relate to home economics content in housing, management, hospitality, institutional maintenance, and food science. Have students investigate community waste management and recycling procedures, discussing how a better community environment can be fostered. Disposal of hazardous products is also an issue to investigate. Encourage students to look at choices made by consumers that affect the environment, such as selecting products that are biodegradable and avoiding those that are not.

Table 10 – continued

Comprehend Basic Concepts of Earth Science	
Concepts	**Explanations and Examples**
Relate weather and climate to housing needs, apparel requirements, health concerns, and production of food and textile products.	**Explanation** • The study of the earth's atmosphere, weather, and climate is called *meteorology*. The *atmosphere* is the gaseous envelope that surrounds the earth. Nitrogen, oxygen, argon, carbon dioxide, and water vapor are the most prevalent gases in the atmosphere, although trace elements of several other gases, such as ozone, also exist. Tiny particles of solid material like dust, rock, dirt, and salt are mixed with gases in the atmosphere. The atmosphere is divided into many layers. The layer closest to the earth is called the *troposphere*; more distant layers are the stratosphere, mesosphere, thermosphere, and exosphere. The pressure, density, and temperature of the air all decrease in the layers as they become farther away from the earth. *Weather* is the current condition of the atmosphere; temperature, air pressure, winds, and moisture interact to cause weather. Weather is predicted by *meteorologists*, scientists who study these interacting weather factors. Weather maps organize current information to provide an overall view of the earth's weather activity. *Climate* is a composite of prevailing weather conditions in a region over a long period of time. Main determinants of climate are precipitation and temperature. Temperature is affected by relative distance from the equator, with warmer climates located closer to the equator. Altitude also affects temperature, with colder temperatures at higher elevations. Regions located near large bodies of water have greater amounts of precipitation. **Example** • Have students compare housing and apparel needs of persons living in tropical, temperate, and polar climates; pictures of the various types of housing and apparel can enhance this activity. Discuss health concerns inherent to certain climates; for example, malaria is widespread in tropical and semitropical climates. On a world map, have students label areas where certain food products and natural textile fibers are produced and note climatic conditions that enable production of the products.

Table 11

Comprehend Basic Concepts of Earth Science	
Concepts	**Explanations and Examples**
	Scientists warn that changes in climate are being caused by pollution and damage to the ozone layer, with health problems caused by increased exposure to the sun's ultraviolet radiation. Have students investigate causes of pollution and ozone damage and suggest practices that minimize their causes and effects.
Recognize how the earth's oceans provide valuable current and future resources.	**Explanation** • *Oceanography* is the study of the oceans. The Pacific, Atlantic, Indian, and Arctic Oceans and smaller bodies of water called *seas* make up one continuous body of water that covers 71% of the earth's surface. Ocean water constitutes about 97% of the earth's water supply. Ocean water is a complex solution of solids and gases in pure water. It is 96.5% pure water (oxygen and hydrogen) with the remainder being chlorine, sodium, and dissolved trace elements. Sodium chloride, made of sodium and chlorine, is one of the salts that gives seawater its *salinity*, or saltiness. Salinity is the number of grams of salts in one kilogram of ocean water, which is approximately thirty-three to thirty-seven grams/kilogram. The most abundant gases dissolved in ocean water are carbon dioxide, nitrogen, and oxygen. The chemical composition of the ocean is fairly constant everywhere, and the oceans provide a stable life environment. Various types of organisms can live at various depths of the ocean. Pressure increases and sunlight decreases at greater depths; therefore, more organisms exist in upper parts of the ocean, closer to shore. Ocean life is classified in the following three major groups: – *Plankton*, the largest group, are microscopic plants and animals that float near the ocean surface. Plankton are important because they produce the majority of the atmosphere's oxygen through photosynthesis and because they are the primary producers in the ocean food web. – *Nekton* are organisms that swim and are able to search for food. Fish, whales, dolphins, and squid are nekton. – *Benthos* are plants and animals that live on the ocean floor, such as crabs, clams, oysters, and starfish.

Table 11 – continued

Comprehend Basic Concepts of Earth Science	
Concepts	**Explanations and Examples**
	The ocean is a rich source of resources. Besides food sources such as plankton, nekton, and benthos, the ocean is a source of fresh water, energy, and raw materials. *Desalination*, removal of salt from seawater, is expensive but provides a possible future means of increasing the freshwater supply. Reserves of oil and gas are located beneath the ocean, and the use of tidal power may provide a future energy source. **Example** • Point out to students that as the human population on earth increases, the ocean's resources become more precious. Have students research food sources from the oceans; students might classify identified food sources according to the three groups of ocean life. In addition, have students investigate ways oceanographers are seeking to increase the ocean's food production capacity, such as sea farming, and identify new sources of food from the ocean. Have students research concerns relating ecology and environmental balance to oceanography; they might predict the effects that destruction of plankton by an oil spill would have on the food web in that area or project possible effects of disposing of waste in the ocean.

Table 11 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
Grasp key concepts related to matter, including properties, states, and physical and chemical changes of matter.	**Explanation** • *Matter* is anything that has mass and volume. Various kinds of matter are recognized by distinguishing characteristics or *properties*. Properties of matter include the following: – *Mass* is the amount of matter in a substance. – *Volume* is the amount of space taken up by a substance. – *Weight* is the response of matter to the pull of gravity. – *Density* is the mass per unit of volume. – Observable properties include color, odor, ability to dissolve, and temperatures at which change of state occurs. Matter may be classified into the following states or forms in which it may exist: – *Solid matter* has definite shape and volume. – *Liquid matter* has definite volume but not definite shape; liquid flows and assumes the shape of its container. – *Gaseous matter* has no definite shape or volume; gaseous matter fills all available space. – *Plasma* is high-energy matter with magnetic fields that prevent particles from escaping. Plasma is rare on earth but makes up the bulk of the universe. Matter undergoes both physical and chemical changes. *Physical changes* are changes in appearance or other properties that do not result in the formation of new substances. Changes in state such as freezing, melting, evaporation, condensation, and sublimation are physical changes. *Chemical changes* produce one or more new substances. Combustion, respiration, and photosynthesis are examples of chemical changes. **Example** • Every substance with which students work is a form of matter. Have students in a textiles and apparel laboratory observe properties of various fibers or create chemical changes in fibers, such as by burning, to identify or classify the fibers. Children may freeze fruit juice to observe liquid and solid forms of matter. In food preparation, have students differentiate physical and chemical changes in matter. For example, scrambling an egg causes physical change; cooking the egg causes chemical change. Baking bread involves both; mixing and kneading create physical changes and leavening causes chemical changes.

Table 12

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
Differentiate between matter existing as elements, compounds, and mixtures.	**Explanation** • The theory that matter is composed of tiny particles with space between is called the *particle theory of matter.* The types and homogeneity of particles that make up a substance determine whether that substance is an element, compound, or mixture, which are defined as follows: – An *element* is the simplest pure substance, made up of tiny particles called atoms. All atoms in an element are the same. – A *compound* is a pure substance made up of two or more chemically combined atoms. All molecules in a compound are the same. – A *mixture* is a combination of two or more substances that are not chemically combined. A *solution* is a homogeneous mixture in which one substance, the *solute*, is dissolved in another substance, the *solvent*. All parts of a solution are identical, the molecules are too small to be visible, and particles do not settle out. The *concentration* of a solution is expressed as the amount of solute dissolved in a given amount of solution. The *solubility* of a substance is the amount of solute that will dissolve in a specific amount of solvent at a given temperature. Heterogeneous mixtures in which particles are temporarily mixed or suspended in solvent include *suspensions*, in which solute particles are large enough to be seen, and *colloids*, in which particles are larger than in solutions and smaller than in suspensions. **Example** • Have students perform experiments to determine the solubility of a substance. For example, determine how much sugar can be dissolved in water at 70°F; vary the water temperature to discover how solubility is affected by temperature. Interpret labels that depict the concentration of solutions such as fruit juice mixtures. Have students cite examples of suspensions and colloids; for example, a mixture of soil and water is a suspension. Examples of colloids are emulsions such as mayonnaise, gels such as butter, and foams such as whipped cream.

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
Identify acids, bases, and salts.	**Explanation** • Substances may be acidic, basic, or neutral. The measure of the acidity of a substance is called *pH*; pH value is measured on a scale ranging from zero to fourteen. A substance with a pH less than seven is an acid, a substance with a pH greater than seven is a base, and a substance with a pH of seven is neutral. Litmus paper is the most common indicator used to measure pH, although other indicators may be used including red cabbage juice and grape juice. Acidic substances are identified by certain properties including the following: – have a pH below seven – turn blue litmus red – have a sour taste – *ionize*, or split into ions, in water to produce a hydrogen ion (H+) – act as proton donors Bases are identified by the following properties: – have a pH above seven – turn red litmus blue – have a bitter taste – ionize in water to produce hydroxide ions (OH-) – act as proton acceptors When acids and bases combine, a chemical reaction called *neutralization* occurs. The acid's positive ion combines chemically with the base's negative ion, resulting in formation of water and salt; acid + base = salt + water. **Example** • Acids and bases have applications in the production of food and textiles and in medicine, management, housing, and institutional maintenance. Assign students to research and report on various applications. Have students distinguish between *strong acids*, those which ionize to a great extent in water and produce many hydrogen ions, and *weak acids*, which ionize to a lesser extent and produce few ions. Examples for further research include use of nitric acid in making fertilizers, the role of hydrochloric acid in digestion, manufacture of carbonated beverages with carbonic acid, use of phosphoric acid in detergent, and production of fibers and films with acetic acid. Have students identify bases found in household cleaning products, antacids, and deodorants, using litmus paper to determine the acidity of substances.

Table 12 – continued

Identify Basic Concepts of Physical Science

Concepts	Explanations and Examples
Understand basic concepts of work and energy.	**Explanation** • *Work* is the result of force applied to an object that causes the object to move. Work = force x distance ($W = F \times d$). Work is measured by the amount of force expressed in newtons times the distance moved expressed in meters; the unit for measuring work is therefore the newton-meter (N-m), or *joule* (J). One newton of force that moves an object one meter does one joule of work. *Machines* are devices that make work easier by changing the size or direction of force applied to do work. *Simple machines* are machines with one or two parts. Simple machines include the following: – inclined plane, such as a ramp or road up a hill – wedge, such as a knife blade – screw – lever, such as a crowbar or oar – wheel and axle, such as a screwdriver or steering wheel – pulley, such as a pulley on a flagpole Compound or *complex machines* include the many machines created by combining simple machines. *Energy* is the ability to do work or the ability to cause change. Forms of energy include mechanical, internal or heat, chemical, radiant, electrical, and nuclear. Mechanical energy can be kinetic or potential. *Kinetic energy* is energy of an object that results from the motion of particles that compose the object. *Potential energy* is stored energy that results from the position of an object being acted on by force. Energy can be converted from one form to another, but the total amount of energy remains the same. *Power* is the rate at which work is done; power = work/time ($P = W/t$). Power is also the rate at which energy is used; power = energy/time. The standard measure of power is the number of joules per second, or *watts*. One joule per second = one watt (W). **Example** • Concepts of work and energy relate to all home economics content areas, with special applications in management. Have students develop a table and list one or more home economics areas in one column; write types of work related to each area in a second column; and list in the third column examples of simple and compound machines that simplify listed work.

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
	Make sure students differentiate between common usage of the word *work* and its scientific definition; work is only done when force is applied and an object moves. By looking up tables showing wattage ratings of various appliances, students can compare amounts of power and energy for each appliance.
Comprehend essential principles of heat and thermodynamics.	**Explanation** • The *kinetic theory of matter* states that matter is composed of particles that are constantly in motion. As particles move with greater energy, a substance becomes warmer; as particles move with less energy, the substance cools. *Temperature* is the measure of average kinetic energy of particles in a substance. Measured in degrees, temperature indicates how hot or cold a substance is. When substances differ in temperature, energy may move from the warmer substance to the colder one. Energy transferred from one substance to another because of temperature differences is called *heat*. Three methods of heat transfer are as follows: – *Conduction* is the transfer of heat within a material or from one material to another by direct contact. *Conductors* are substances that effectively transmit heat; *insulators* are substances that inhibit heat conduction. – *Convection* is heat transfer through actual movement of molecules within a liquid or gas. Molecules in a heated substance move farther apart and are forced upward as cooler, more densely packed molecules sink. This process creates convection currents within the gas or liquid. – *Radiation*, or radiant energy, is energy that moves through space in waves, without being carried by matter. Heat is one type of radiant energy; other examples are light, X-rays, and microwaves. Heat transfer results in a substance gaining or losing heat. The amount of heat gained or lost by a substance is measured in units called *calories*; one calorie is the amount of heat required to raise the temperature of one gram of water by 1°C. **Example** • Have students research and compare appliances that cook by conduction, convection, and radiation. The specific focus of the comparisons will vary depending on content areas, such as consumer economics, management, housing, or food science and nutrition.

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
	A report on microwave cooking or microwave myths would allow further investigation of radiant energy. Convection currents are the basis of heating and cooling systems used in homes and businesses. A discussion of conductors versus insulators might relate to the following areas: – housing methods of preventing loss of cool or warm air – textiles and apparel fabrics as insulators – child development infant and toddler apparel for heat and cold – family health relation of health to maintenance of environmental temperature Have students investigate how caloric content of foods is determined and chart calorie expenditures required to perform various physical activities.
Understand basic characteristics of waves.	**Explanation** • A *wave* is a disturbance that travels through space or matter, carrying energy. A *medium* is the substance through which a wave is transmitted. For example, air is the medium for sound waves, and water is the medium for ocean waves. There are two types of waves which are as follows: – *Transverse waves* cause matter to move in a direction perpendicular to the direction of the wave's motion. Transverse waves resemble hills and valleys, with the *crest* being the highest point and the *trough* the lowest point of each wave. – *Compressional waves* move molecules in a manner resembling the coils of a spring through a series of compressions and rarefactions. A *compression* is a space in the medium in which molecules are squeezed together, resulting in molecules subsequently being pushed forward. This leaves a space behind containing fewer molecules, called a *rarefaction.* All waves have the following common properties: – The *amplitude* indicates a wave's energy; amplitude is the distance a medium's molecules are displaced. – The *wavelength* is the distance from one crest or trough to the next in a transverse wave, or the distance from one compression or rarefaction to the next in a compressional wave.

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
	– *Frequency* is the number of wavelengths arriving in a unit of time. The standard unit for measuring frequency is the *hertz* (Hz), which equals one wave per second. **Example** • Knowledge of wave properties is central to understanding concepts related to sound and light. As students relate sound and light to home economics content in the following sections, a review of basic wave concepts may be needed.
Apply principles of sound and sound control to the home and workplace.	**Explanation** • *Sound* is energy produced by vibrating matter that travels in a compressional wave. Common properties of waves translate into the following properties of sound: – The amplitude of a sound wave determines the *intensity* of sound. Larger amplitude equals greater intensity. *Loudness* of sound is the effect of sound intensity on the human ear; greater intensity causes louder sound. However, loudness varies among individuals; what is loud to one person may not seem loud to another. *Noise level*, the intensity of sound, is measured in decibel units. A sound of zero decibels is the softest sound that can be detected by the human ear. The loudest sound that can be heard without pain is usually 120 decibels, although hearing loss can occur at lower decibel levels. – Frequency of sound determines *pitch*, how high or low a sound seems. Listening to sound is a function of the human ear. Sound waves pass through the ear canal to the eardrum, a vibrating membrane; through an air-filled space called the middle ear; and to the liquid-filled cochlea in the inner ear. Resulting movements in this liquid trigger special cells to send neurological messages through the central nervous system to the brain where the messages are interpreted as sound. *Noise* is unwanted or unpleasant sound. Noise becomes *noise pollution* when it reaches a level that is harmful to people or property. Sound can be controlled through restricting loudness of sound and use of noise sources and by using sound-absorbent materials.

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
	Example • Homes and workplaces can be designed and constructed in ways that enhance or control sound. Have students look for examples of sound-insulating materials such as ceiling tiles and floor and wall materials that lessen noise. Have students contrast sound-insulating materials with materials used in structures such as auditoriums where sound needs to be enhanced instead of lessened. Note how landscaping with bushes, trees, or elevated areas can lessen noise pollution in the home or workplace. Children, elderly persons, and persons with handicaps require special sound control attention, as they may be unable to protect themselves from damage caused by noise pollution. Note health practices that protect the human ear from damage and stress the importance of seeking medical attention if damage or hearing loss is suspected. Topics related to sound and noise in the workplace include the relationship of music and work quality and the effect of noise on work quality in various situations.
Gain an understanding of light and its properties.	**Explanation** • *Light* consists of photons, tiny bundles of energy released by atoms when electrons discharge extra energy that has built up. Light sometimes acts as a wave, with measurable frequency and wavelength, but it also may exhibit characteristics of particles. Light waves are called *electromagnetic waves* because they generate both electric and magnetic fields. Light waves may be visible or invisible to the eye, depending on the energy (frequency) of the photons. Electromagnetic waves arranged in order of frequency constitute the *electromagnetic spectrum*. This spectrum, from low frequency to high frequency, includes radio waves, microwaves, infrared rays, visible light, ultraviolet light, X-rays, gamma rays, and cosmic radiation. The following properties are common to all forms of light: – travels at the high speed of 300,000,000 meters per second through space – travels as transverse waves – travels in a straight line through a single medium but is bent or refracted when passing from one medium to another

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
	When light waves contact matter, the light can be transmitted, reflected, or absorbed. *Transparent matter* transmits light with no scattering. *Translucent matter* transmits and scatters light, resulting in an unclear image. *Opaque substances* reflect or absorb light. Matter can also be the source of light; *luminous objects* such as the sun, flames, and light bulbs produce light. *Incandescent light* is light produced by heating an object to make it glow, such as a home light bulb. *Fluorescent* and *neon light* are produced when electrons interact with gas, causing discharge of light. *White light* such as sunlight is a combination of all colors of visible light. White light can be split into colors of the spectrum (red, orange, yellow, green, blue, indigo, and violet) by a prism or by sunlight refracted by water droplets seen as a rainbow. The color of an object is determined by the colors of light striking an object and by the object itself. Visible light is detected by the eye, just as sound is detected by the ear. Light is refracted by the cornea and then the lens as it enters the eye, causing real images to form on the retina at the back of the eye. Nerve cells in the retina carry image messages through an adjacent nerve to the brain. **Example** • List waves in the electromagnetic spectrum and have students investigate how each impacts housing, family health, textiles and apparel, food science and nutrition, and family life. Have students experiment with various fabrics to determine how texture, weight, and color of fabric affect light reflection and absorption, thus relating to comfort. Lead students in comparing and contrasting use of incandescent, fluorescent, and neon light in housing, management, or consumer economics. Have students cite how advances in lighting technology have impacted family life.
Understand basic principles of electricity.	**Explanation** • Matter is made up of atoms, which contain smaller particles with electric charges. Electrons have negative charges, protons have positive charges, and neutrons are neutral. Charged particles exert forces on each other; unlike charges attract and like charges repel each other. Since an atom has a like number of protons and electrons, it has a balanced charge.

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
	When electrons move from one object to another, an overall negative charge is created in the recipient. *Static electricity* is the buildup of electrical charges that do not move. Electrical charges can build up on objects and generate a shock when touched. Older appliances often allow charges to build up on the metal motor case. Charges that build up will follow the easiest path to the ground through a conductor called the *ground*. A person touching the object acts as the conductor and receives a shock. Newer appliances avoid this danger with a third prong in the electric plug that provides a ground. Older appliances can be grounded by attaching a wire from the case to a cold water pipe going underground. Charges that move through matter create an *electrical current*. A substance through which electrons move easily is called a *conductor*; metals are good conductors of charge. Good *insulators* such as glass, plastic, and rubber do not conduct well. Insulators have high resistance. *Resistance* is opposition to the flow of current. The SI unit for measuring resistance is the ohm. There are two kinds of electrical current. In a *direct current* (dc), electrons always move in one direction, from the negative towards the positive terminal. Dry cells and batteries provide direct current. In *alternating current* (ac) electrons reverse direction many times each second. Standard household current in North America is current that alternates at a frequency of sixty cycles per second, or sixty hertz. The unit used to measure current is the *ampere* or *amp* (A). It is measured by a device called an *ammeter*. Current can only move through an unbroken path of conductors called a *circuit*. All parts of a circuit may be connected in a row, creating a *series circuit*. In a series circuit of light bulbs there is only one path for the current to take. If one bulb burns out or is removed, all bulbs go out because the current halts. Conductors in a circuit may be arranged on separate branches to create a *parallel circuit*. Since alternate paths are provided for electrons, the circuit remains intact even if a break occurs at one point. The arrangement of various parts in an electric circuit is depicted by symbols in a *circuit diagram*.

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
	Charges move when energy is supplied to move excess electrons. The amount of energy supplied per unit of charge is called *voltage.* A dry cell, such as a flashlight battery, is one means of providing voltage. The SI unit for measuring voltage is the *volt* (V). A voltmeter determines voltage by measuring voltage drop across a circuit. Electric current, voltage, and resistance possess a constant relationship, expressed by an equation called Ohm's law. *Ohm's law* states that current = voltage/ resistance. Remember that current is measured in amps, voltage in volts, and resistance in ohms. Therefore, one volt causing a current of one amp equals one ohm of resistance. *Electric power* is a measure of the rate at which electricity provides energy. Power is measured in joules per second, or *watts.* An electric company charges for power supplied on the basis of kilowatt-hours used; one kilowatt-hour equals 1000 watts of power used for one hour. Appliances are rated by the amount of watts used. Wattage = volts x amperes. Safe use of electricity requires important precautions. Damaged wires should be repaired because they can result in short circuiting and overheated wires that can catch fire. Homes and businesses are equipped with fuses or circuit breakers, safety devices that protect a circuit from being overloaded and shut down a circuit if too much current is flowing through. **Examples** • Static electricity can be demonstrated by experiments creating friction between a balloon and various fabrics. Have students discuss the importance of controlling static electricity in fabrics; for example, fabric that attracts dust and clings would not sell, garments made from the fabric would be bothersome, and in an apparel factory dangerous sparks could result from build up of static electricity. Have students investigate effectiveness of antistatic agents that reduce static electricity in carpets, garments, and hair. • Note the importance of three-pronged plugs in preventing electrical shocks and stress the hazards of disregarding or adapting the plugs. Have students research and determine how to safely ground appliances that lack three-pronged plugs.

Table 12 – continued

<table>
<tr><th colspan="2">Identify Basic Concepts of Physical Science</th></tr>
<tr><th>Concepts</th><th>Explanations and Examples</th></tr>
<tr><td></td><td>• Appliance comparisons offer opportunities to apply knowledge of electricity. Have students compare wattage ratings and efficiency; practice computing the wattage, voltage, or amps when two of the three are known; and explain why overseas travel or sale of appliances to other countries may require adaptation to fifty hertz current. Have a resource person illustrate use of an ammeter and voltmeter and cite precautions in using the devices.

• Electric safety is a concept that relates to all home economics areas. Have students develop a list of electrical safety practices to follow. For example, discuss what to do when a fuse or circuit breaker trips a circuit; note especially <i>not</i> to reset the circuit until the overload is eliminated. Have students include special safety precautions to take regarding children, elderly persons, and persons with handicaps.</td></tr>
<tr><td>Explain the importance of energy resource conservation.</td><td>Explanation
• Electrical and nuclear energy are not sources of energy. They are forms of energy produced from energy sources. Energy from a source like the sun comes to humans through a set of changes in form known as an <i>energy pathway</i>. Energy changes are not reversible, and some energy is rendered unusable with each change in form.

Fossil fuels, including coal, oil, and natural gas, are energy sources created over millions of years from organic remains. Fossil fuels are <i>nonrenewable resources</i>, sources of energy used faster than the rate at which they can be replaced. Growing population and industrialization have increased the demand for fossil fuels, which will eventually be depleted.

To meet the world's energy demands, new renewable sources of energy are sought. <i>Renewable resources</i> can be replaced at about the same rate they are used. Wood is returning as a source of heat and energy. Synthetic fuels such as gasohol have been invented. Biomass, a fuel made from organic remains and byproducts, is being used as a combustible fuel. Nuclear fission reactors, wind, hydroelectric power plants, solar power, and geothermal energy are additional renewable resources.</td></tr>
</table>

Table 12 – continued

Identify Basic Concepts of Physical Science	
Concepts	**Explanations and Examples**
	Energy conservation, the wise use of natural resources, can be accomplished by limiting use of energy and avoiding waste. Fossil fuels must be conserved to extend their availability. Conservation practices include using automobiles more wisely, heating and cooling homes and businesses more efficiently, constructing homes and businesses that are more energy efficient, and recycling to reduce industrial waste. **Example** • Have students relate housing and management concepts to principles of resource conservation by compiling and publishing a list of ways to reduce energy consumption in the home and workplace. Suggest ways to maintain comfort in the home when setting the thermostat higher in the summer and lower in the winter. For example, change humidity levels, use ceiling fans, and alter apparel worn. Instruct students to develop a lesson for teaching young children basic conservation practices. Have students investigate and report on new alternative energy sources, listing advantages and disadvantages of energy sources such as fossil fuels, nuclear breeder reactors, biomass, wind, and geothermal energy.

Table 12 – continued

Develop Manipulative Laboratory Skills

Concepts	Explanations and Examples
Demonstrate the safe use of equipment and supplies.	**Explanation** • Learning science depends greatly on hands-on experiences; therefore, safety is of utmost importance. By recognizing and practicing safety procedures in laboratory experiences, students protect themselves from immediate danger and build safety habits for the future. Understanding science concepts such as electricity, chemical reactions, microbiological hazards, and waste disposal can supplement safety procedures already emphasized in home economics laboratories. **Example** • Have students research safety procedures to follow when performing laboratory experiences and prepare written summaries or demonstrations to depict the safety procedures. Examples include safe use of cleaning and sanitation chemicals; appropriate food storage, handling, and preparation temperatures; cross contamination; personal hygiene; and electrical or other physical hazards. Students might research designated sanitation procedures to observe in home economics laboratories and depict the procedures through demonstrations or written summaries.
Demonstrate correct investigative procedures and techniques.	**Explanation** • Students should learn to use *comparators*, qualities for making comparisons between entities, when performing investigative procedures. Examples of comparators are color, texture, taste, odor, size, and shape. Students should also learn to appropriately select and correctly use measuring devices and instruments such as scales and balances, rulers, microscopes, and machines. **Example** • Have students classify fibers or food products according to comparators such as color, texture, taste, odor, and size. Have them match appropriate equipment and measuring devices with specific tasks, always considering safety.

Table 13

Develop Manipulative Laboratory Skills	
Concepts	**Explanations and Examples**
Understand the relationship of measurements and standards.	**Explanation** • A measurement is meaningful only in relation to a standard. If children use a pencil as a measuring device, the pencil is the standard for their measurements; a desk thus measured may be three pencils high. The two systems commonly used in the United States as standards of measurement are the metric system and the customary system. The universal system of measurement used by scientists worldwide is the SI metric system; *SI* comes from the French name for international system. The metric system is easier than the customary measurement system used in the United States because it is based on multiples of ten with designated prefixes common to all metric units for measuring distance, mass, and volume. Distance is measured in meters, using a meter stick or metric ruler. *Mass*, the amount of matter in something, is measured in grams by using a balance. Types of balances include double-pan, triple-beam, and electronic. Volume is measured in liter or cubic centimeter units, using a household measuring cup or laboratory graduated cylinder. Temperature is measured using a Celsius scale, where the freezing point of water is 0°C and the boiling point is 100°. The basic SI unit of time measurement is the second. **Example** • Teaching Aid 2, Metric Units of Measure, overviews SI units of measurement. A bulletin board or visual aid may be used to reinforce measurement concepts. Learning to read thermometers accurately in family health, measuring lengths of textile fibers, and determining total space available in a child care center give students opportunities to gain skill in measuring.

Table 13 – continued

Apply Science Process Skills	
Concepts	**Explanations and Examples**
Use observation skills in acquiring data through the senses.	**Example** • Reinforce the importance of making accurate and skilled observations. Situations requiring observation skills using the senses include the following: – Students in child development laboratories observe children by using the senses of sight, touch, hearing, and smell to decipher situations. – Students studying hospitality services use all senses to evaluate baked products. – Fibers and fabrics are differentiated on the basis of sensory observation. Have students use equipment such as microscopes and magnifying glasses to extend sensory capacity.
Use classification skills in ordering and sequencing data and classifying biological organisms, objects, and events according to similarities and differences.	**Explanation** • *Classification* is the process of grouping items according to similarities or differences. Scientists order and sequence data to make information more meaningful. Classification reduces complexity and makes sense out of one's environment. Stars, rocks, human body systems, and numerous other scientific data are classified according to established systems. Matter can be classified in many ways. For example, substances may be grouped according to phases (solid, liquid, or gas) or as being metallic or nonmetallic. Living organisms are classified according to a taxonomy consisting of the following seven classification levels: kingdom, phylum, class, order, family, genus, and species. *Kingdoms* are the broadest level of classification. Currently there are five kingdoms in which all living things are classified. As new organisms have been discovered and as new characteristics of organisms have been identified, the number of kingdoms has changed and may change again in the future. The next level of the taxonomy is a *phylum*, a group within a kingdom whose members share one or more key characteristics. Within a phylum are *classes*, smaller groups with common characteristics. Ranked below classes are orders, families, genera, and species. As the classification system progresses to smaller groups, members are more alike in each group. For example, members of a species have many traits in common and can mate and reproduce more species members.

Table 14

Apply Science Process Skills	
Concepts	**Explanations and Examples**
	Since the seven-level classification system would be a cumbersome label for each organism, scientists give each organism a scientific name consisting of the genus and species. This system of assigning organisms a two-part Latin name is called *binomial nomenclature*. Thus, the scientific name for a human is Homo sapiens and for a dog is Canis familiaris. Students also need skill in classifying and sequencing data according to their own observations. **Example** • Diseases, careers, fibers, nutrients, and types of housing are examples of home economics concepts that can be classified by students. After defining classification and explaining its importance, give students a list of such concepts and have them group the items in a meaningful manner, explaining the reasoning for each classification system. By participating in a classification experience at the introduction of a new unit of study, students are given an opportunity to discover upcoming concepts on their own. Have students observe children in a child development laboratory and classify and record fine and gross motor skills and examples of intellectual, social, and physical development.
Apply the scientific method in experimentally testing hypotheses and identify and manipulate the conditions of investigations, identifying the variables remaining constant, the variables being manipulated, and the variables responding in an investigation.	**Explanation** • The scientific method is a means of solving problems scientifically; experiment is central to science. The scientific method is a methodical process of controlling and manipulating variables while adhering to scientific standards of attitude and behavior. However, actual steps in the scientific method may vary. Steps in the scientific method are as follows: 1) Identify the problem and state it clearly as a question. 2) Gather information by such means as reading or observing. 3) Form a hypothesis, or possible answer to the problem, based on information gathered through research or observation. 4) Test the hypothesis through experiments or carefully recorded and classified observations. 5) Draw conclusions based on results.

Table 14 – continued

Apply Science Process Skills

Concepts	Explanations and Examples
	Attitudes central to scientific inquiry include honesty, objectivity, openness, skepticism, questioning, accuracy, carefulness, and unbiased evaluation. **Example** • Design opportunities for students to plan and conduct investigations and review the process and attitudes central to the scientific method. When applying the scientific method, students may follow the format similar to that suggested in Teaching Aid 5, The Scientific Method. The scientific method may be used in situations such as the following: – Have housing students experiment with various types of lighting or methods of control. – Have students in a food science laboratory alter ingredients in baking to determine the effects of various leavening agents on food products. – Instruct students in a textiles laboratory to investigate various dying processes. – Assign students to identify variables hypothesized to contribute to effective family functioning. – Have students research effective methods of managing multiple responsibilities of work and family. – Have students determine ways to alter family menus for a family member on a low cholesterol or low fat diet or for a diabetic family member. – Have students experiment with various textile and apparel laundry products. – Have students experiment with various hard surface cleaning or care products. – Have students experiment with various surfaces, colors, and textures to determine those most appropriate for elderly persons.
Draw logical inferences, predict outcomes, and form generalized statements.	**Example** • Have students make inferences and predictions by completing activities such as the following: – Predict outcomes of actions. If proper health practices are ignored, what outcomes may result? – Analyze trends in data and draw inferences and make predictions. Given data on world population changes and depletion rates of nonrenewable resources, what can be inferred and predicted about resource management?

Table 14 – continued

Apply Science Process Skills	
Concepts	**Explanations and Examples**
	– Predict cause and effect relationships. What effects has substance abuse had on the health of individuals and families? Questions such as the following help students make inferences and predictions: – What might you expect to happen if… – What do you think may have caused… – What might you do to prevent…
Relate objects and events to other objects and events; transfer learning.	**Example** • What students learn in the classroom is intended for use in their lives. Examples of situations in which students transfer learning are as follows: – As students observe and interact with children in a child development laboratory, they learn concepts and skills that will enable them to care for children in a home or work setting. – As students contrast human activities that affect the environment, they see ways they personally impact the environment; a learning experience on recycling can extend this transfer of learning. – Safety and sanitation procedures practiced in an institutional maintenance course strengthen lifelong well-being and employability.
Apply defined terms based on observations.	**Example** • Since birth, students have been making observations and mentally filing data. As they develop a conceptual science framework, students begin to apply technical terms and knowledge to phenomena they have experienced. They learn to state and clarify operational definitions that explain scientific principles. Encourage students to explain phenomena they observe in classroom and outside experiences; discuss why proper climate control is important to children, why bread rises, why plants require water and light, and why sanitation helps prevent spread of infectious diseases.
Communicate oral and written data in appropriate form.	**Example** • Provide opportunities for students to share their experiences through oral reports and group discussions. Have students write down the steps in investigations using the scientific method. Data might be recorded in tables, charts, and bar or pie graphs. Encourage students to describe, name, interpret, and explain, building skills in higher-order thinking while developing communication skills.

Table 14 – continued

Apply Science in Daily Life

Concepts	Explanations and Examples
Locate, evaluate, and utilize sources of scientific information.	**Explanation** • The purpose of this objective supersedes discovery and sharing of facts; students may find themselves in future employment or family situations where being able to access scientific information successfully is critical to employability or health. **Example** • Provide opportunities for students to practice locating sources of information. In a food science unit of study, have groups of students research and explain the chemical and physical reactions that take place in baking; they may consult reference books, textbooks, or resource persons such as chemistry teachers or other science content teachers. Students studying family health might similarly research the effect of substance abuse on human body systems. Provide opportunities for students to research and write about microbiological concerns that adversely impact the food and water supply.
Use scientific information to solve problems and make responsible decisions for the benefit of the individual and society.	**Example** • The ultimate purpose of science is application to benefit individuals and society. The conceptual framework and process skills developed in science enable students to solve problems and make responsible decisions in their daily lives. Allow small groups of students to explore and discuss decisions related to housing, parenting, family health, and other home economics areas. Have students analyze how knowledge of science principles enables individuals to make responsible, educated decisions about their homes and families, environments, and career options.
Use rational and critical thinking skills as the basis for inferences and actions.	**Example** • Central to the nature of science is the ability to think rationally, to base inferences and actions on fact and grounded reason rather than ungrounded opinion and emotion. As students explore to solve scientific problems, they learn to follow an objective process of observing and testing hypotheses. They develop an appreciation for honesty and unbiased evaluation of results.

Table 15

Apply Science in Daily Life	
Concepts	**Explanations and Examples**
	Assist students in transferring these practices to personal thinking and decision-making processes. For example, before students choose products purely on appearance, decide to go on diets reputed to be effective, or make decisions regarding such crucial topics as parenting or sexual activity, have them apply the scientific method of reasoning. Discuss examples of other ways rational, scientific inquiry skills can help students engage in more responsible and healthy actions.

Table 15 – continued

Fundamental Principles of Language Arts

Introduction

The ability to communicate through language, or human speech, is the basis of our civilization. Language involves words, symbols, gestures, and other forms, both oral and written, used to express meaning and to communicate. *Basic literacy* is defined as the ability to read and write. The ability to read, write, and communicate well is essential to success in school, work, and all areas of life. Without the ability to use language skills effectively, an individual is unable to participate fully in any social setting. Without basic reading and writing skills, an individual is defined as illiterate.

Great concern exists that many individuals today do not possess language skills required for basic literacy. Many other individuals possess moderate levels of language skills but lack the skill levels needed for employability and social adaptation and productivity. Even those individuals with adequate skills for living will find job options limited in a workplace that requires increasingly high levels of language skills to advance in position and income.

Our society is becoming increasingly complex, with information and technology expanding at an astounding rate. The ability to decode, process, and assimilate oral and written information is essential for the success of the individual, the workplace, and society. Language skills are essential to the lifelong learning process required to adapt and prosper in today's complex society. The principles of language arts encompass the concepts and strategies essential to competence in language skills.

Language Arts Instruction

As in the academic fields of mathematics and science, educators are seeking the most effective means of teaching language arts principles as they continually monitor students' performance. Students as a whole have shown improvement in lower-level skills and basic concepts measured on standardized tests, but they show declines in higher-level applications. While students can read well enough to grasp basic material, too many are unable to understand and analyze more complicated information or to summarize or explain their understanding. While students are often able to perform specific writing tasks, too many are incapable of communicating effectively or writing to achieve varying purposes.

> "Language arts instruction should focus primarily on hands-on, student-centered learning activities, as opposed to passive, teacher-centered activities."

With heightened concern that students have failed to achieve desired levels of language arts competence, instructional strategies in language arts are undergoing many of the same revisions as the other academic fields. The study of language arts includes skills in reading, writing, language, literature, speaking, and listening. These skills traditionally have been taught as separate skills, with primary instructional emphasis on the mechanics of grammar and the conventions and tools of language.

While the mechanics and conventions remain important, the trend today is toward an integrated approach to language arts instruction, teaching essential concepts and skills more as a whole than in parts. In this integrated approach, one or more language arts skills is taught in the subject matter context of another. For example, mechanics of writing are taught to students while they are actively involved in the composing process in writing or the comprehending process in reading; grammar concepts are included while teaching composition and style; and reading, language, and writing skills are strengthened when literature selections are studied.

Within this integrated approach, certain teaching strategies help individuals become self-directed and independent readers, writers, speakers, and thinkers. The following strategic elements are recommended:

- involvement – Language arts instruction should focus primarily on hands-on, student-centered learning activities, as opposed to passive, teacher-centered activities.

Students build language skills through active use. Instruction is most effective when students are involved in personal, meaningful ways.

- frequent practice – Language is a recursive process; students continually return to what they know and build from there, taking knowledge to higher applications and skill levels each time. Therefore, frequent practice is essential for students to build and internalize language skills. Reading skills improve as students read more. A major cause of low reading competence is infrequent practice; many students read little at school or home and often prefer television to leisure reading. By encouraging reading at school and at home and by deliberately building reading practice into assignments or learning experiences, reading skills will be reinforced. The same obviously holds true for writing and oral communication skills.
- variety – Language arts skills are essential to all areas of life, throughout one's entire life. To obtain effective oral and writing skills in a complex society, students must be able to vary their methods to fit a variety of purposes and audiences. Students need to vary their techniques as they read for pleasure, information, or technical expertise. They must vary writing modes according to the specific purpose and audience of each composition. By providing as many varied learning experiences as possible, teachers can help students learn to adapt skills appropriately.
- higher-level thinking – Most secondary students possess basic reading and writing skills. However, today's society requires that students be able to understand complicated information and articulate their understanding. The ability to apply, synthesize, and evaluate is dependent on higher levels of language arts skills. Skill levels are raised through learning experiences that take students to higher levels of thinking, including critical thinking

Technology continually provides new language tools for teachers and students. When opportunities exist for students to utilize computers and word processors in the classroom, teachers should provide each student as much practice as possible. Computers and word processors shorten the composing process in writing, allowing students more time to generate and refine ideas. Since these tools will be widely available to the general population in the future, students will benefit from experience in their use.

Principles of Language Arts

The individual components, or the arts of language, include writing and speaking, reading and listening, and the conventions of language. The *conventions of language* are those tools that make language consistent and understandable, such as mechanics of grammar and usage, spelling, and handwriting. Reading and listening skills enable individuals to receive information; writing and speaking are communication skills for imparting information.

Table 14 summarizes the fundamental principles of English language arts, based on the essential elements approved by the Texas State Board of Education. Integrated writing and language concepts encompass the composing process and use of conventional writing and language skills. Integrated reading, listening, and literature concepts enable students to construct meaning from written and oral text and use valuable literature selections.

The Composing Process

Writing is a process that includes generating ideas, drafting those ideas on paper, and refining the ideas to achieve the completed text. This process is called the *composing process.* Although the labeling and numbering of steps may vary, the process is extensively taught today in writing throughout the curriculum. Table 15 outlines and elaborates steps in the composing process, defines the main purposes and modes of writing, and gives suggestions for home economics applications.

While the entire composing process cannot be taught or covered with every writing assignment, reinforcing the process where feasible can help students internalize writing skills. A teacher might walk students through the process for major writing assignments. On shorter assignments, students might be reminded that the finished text can be improved by using the steps of prewriting, drafting, and refining. Teaching Aid 6, The Composing Process, can be used to remind students of the steps.

Conventional Writing and Language Skills

Principles relating to conventional writing and language skills are briefly reviewed in Table 16. Time and purpose will affect teachers' decisions regarding focus on these specific principles. Certain conventions are more easily reinforced within home economics content, such as vocabulary and word choice. Reinforcing correct use of parts of speech and correct sentence structure are more difficult and time-consuming tasks; each teacher must decide independently how to assist students with conventional writing and language skills.

As the move toward integrating academic and vocational education throughout the curriculum grows, more resources emerge to assist teachers in addressing language skill deficiencies in specific students. Cooperative efforts among academic and vocational teachers can lead to resources such as special resource personnel, tutorials, computer assisted remedial instruction, and peer evaluation and assistance. Even in the absence of these resources, a teacher might use cooperative learning as a means of having students evaluate the writing of one another. A language arts teacher might be asked to assist in evaluating mechanics in key assignments.

Conventional writing and language skills improve through practice in writing and reading, even when details are not specifically addressed. Therefore, if home economics teachers provide multiple, varied opportunities for writing and reading practice, guiding students as much as possible toward correcting blatant spelling and grammatical errors, they will reinforce students' language skills and abilities to communicate.

Reading and Listening to Construct Meaning

Since reading is the primary tool students employ to construct meaning in any content area, all teachers share the goal of raising students' reading levels. In our information society, students must develop skills beyond the basic ability to read for the main point presented in a text.

Students must read and listen for understanding, to construct meaning rather than just absorb information. They must read widely and diversely, reading as many kinds of literature and text as possible. They must read and listen critically. They must be able to recognize and evaluate points of view, distinguish between fact and opinion, and resist efforts to coerce or control through propaganda.

The principles elaborated in Table 17 identify concepts and strategies relating to reading and listening skills.

Literature

Within an integrated language arts curriculum, literature selections provide a basis for skill development in all the language arts. Meaningful literary pieces simultaneously provide insights into differing cultures and one's own heritage, broaden one's experience beyond immediate confines, and provide exposure to life from different points of view. Students also learn to appreciate the forms, devices, and figurative language of literature.

In home economics courses, literature selections can provide a rich and varied background for exploring and discussing relevant concepts such as those related to cultural practices, food habits, family lifestyles, and unique careers. Literature can enhance personal development by serving as an outlet for development and expression of self-esteem, and it can provide a lifelong option for recreation and stress management.

Language arts principles relating to literary forms, terminology, and characteristics are presented in Table 18. Resources such as a school or local librarians can help identify specific literary selections that can enhance study in a specific home economics course area.

Reinforcing Language Arts Principles in Home Economics

Reinforcing language arts principles in other subject content areas, such as home economics, is a powerful integrative approach. Students must be able to read, write, speak, spell, and perform essential language arts skills in order to achieve objectives in home economics course work. Vocational home economics classes provide excellent settings for students to become aware of the importance of language arts principles to their future success and employability, to obtain practice in language skills, and to reinforce confidence in their own language abilities.

Integrating language arts to a greater extent in home economics might seem a formidable challenge, considering the scope of language arts principles and the range of student abilities in a given classroom setting. The integrative approach does not suggest that the home economics teacher teach or reteach all language mechanics and concepts in isolated lessons; rather, language arts principles should be reinforced holistically within home economics content. A review of language arts is provided as a resource for teachers seeing a need to reinforce specific skills. Studies indicate that language skills improve through guided practice in reading, writing, speaking, and listening, even without specific focus on mechanical conventions.

Evaluation, especially of written compositions, might also raise concerns for vocational teachers. Holistic and nontraditional means of evaluating, such as peer evaluation and self-evaluation, provide alternatives to time-consuming, analytic evaluation of separate writing components. Suggestions for quick, effective evaluation in each academic area are included in the "Teaching and Evaluation Strategies" section of this book. Also included in this section are suggestions for modifying strategies for students with special needs, including limited English proficient students and students with handicaps.

Integrated Writing and Language Concepts and Strategies

Use the composing process in writing.

- Plan and generate oral and written compositions for a variety of purposes and audiences.
- Prewrite and plan using material from various sources such as personal experience, literature, and idea-generating strategies including conferencing.
- Write first drafts of compositions, varying form and purpose of discourse.
- Revise and refine compositions using self-assessment, peer interaction, conferences, and individualized techniques.
- Proofread written work for internal punctuation errors, spelling errors, grammatical and syntactical errors, correct paragraph indentation, correct margins, and legibility of writing.
- Evaluate content, organization, topic development, transition, clarity of language, and word and sentence variety according to the intended purpose and audience of the composition. Evaluate one's own writing as well as that of others.
- Share written products in a variety of ways.

Demonstrate the use of conventional writing and language skills.

- Use the forms and conventions of written language appropriately.
- Choose appropriate words to convey intended meaning.
- Vary word and sentence choice for purpose and audience.
- Demonstrate facility with word analogies and other forms of advanced vocabulary development.
- Recognize the meanings and appropriate uses of colloquialism, slang, idiom, and jargon.
- Use all parts of speech effectively in sentences.
- Use a variety of sentence structures including simple, compound, and complex.
- Refine sentences and paragraphs into compositions exhibiting unity, clarity, and coherence.
- Write longer compositions incorporating outside information with documentation.
- Make language choices to convey tone and mood, as well as ideas.
- Produce oral discourse and share written discourse orally.
- Use oral language effectively in a variety of situations.

Integrated Reading, Listening, and Literature Concepts and Strategies

Construct meaning from written and oral text.

- Expand vocabulary by determining word meanings through context clues and use of specialized dictionaries.
- Identify the stated or implied main idea of a selection and express the main idea in one sentence.
- Recognize relevant details.
- Identify the sequential order of events.
- Perceive cause and effect relationships.
- Recognize and evaluate the author's point of view.
- Distinguish between fact and opinion, grounded and ungrounded belief, and rational thought and rationalization.
- Recognize different forms of propaganda.
- Evaluate and make judgments.
- Make written notes while avoiding plagiarism.

Table 14

- Interpret complex maps, charts, and tables.
- Develop study strategies.
    - Locate information using the format and organization of a book.
    - Locate information using appropriate reference materials such as dictionaries, atlases, encyclopedias, almanacs, and bibliographies.
    - Follow complex directions.
    - Adjust reading procedures, techniques, and rates according to purpose.
    - Prepare for subject area assignments.

Use meaningful, culturally valuable literature selections.

- Understand and analyze the major differences among various literary genres.
- Recognize cultural attitudes and customs in literary selections.
- Understand and analyze language used denotatively and connotatively in literary selections.
- Understand and analyze major types of sound devices and figurative language as they contribute to meaning.
- Use basic literary terminology.
- Identify irony, tone, mood, allusion, and symbolism in literary selections.
- Understand and analyze the elements of fiction as they contribute to meaning.
- Recognize the development of an overall theme in a literary work.
- Broaden and deepen personal experience through imaginative and emotional engagement with literature.

Table 14 – continued

Use the Composing Process in Writing	
Concepts	**Explanations and Examples**
Plan and generate oral and written compositions for a variety of purposes and audiences.	**Explanation** • The purpose of compositions may be to inform, to express, to persuade, or to entertain. Potential audiences include oneself, the teacher or other individual, a small group, a large formal or informal group, and the general public. **Example** • Provide numerous, varied opportunities for students to generate written compositions. For example, have students write the following: – letters to the editor comparing and contrasting child care alternatives – letters to persuade members of Congress to consider legislation on housing – essays on future trends in home economics careers, shared orally with the class – summaries of group discussion on stress management – research papers on resource scarcity – theme songs, poems, or raps relating to being an adolescent
Prewrite and plan using material from various sources such as personal experience, literature, and idea-generating strategies including conferencing.	**Example** • Review steps of the composing process when assigning writing tasks. The steps are summarized in Teaching Aid 6, The Composing Process. *Prewriting* is the stage of the composing process where ideas are generated and data is collected. Ideas may be generated through brainstorming, group discussion, interviewing, personal experience, journal writing, and examples in books or periodicals. Have students plan a composition on a specific home economics topic by brainstorming, discussing ideas with the teacher or peers, and/or researching references such as textbooks, reference books, news articles, literary selections, or periodicals.
Write first drafts of compositions, varying form and purpose of discourse.	**Explanation** • The purposes of writing from which students may choose include the following: – *expressive writing* clarifies what an individual thinks and feels, providing an emotional outlet – *informative writing* provides information or explores – *persuasive writing* attempts to change the thinking of the audience

Table 15

Use the Composing Process in Writing

Concepts	Explanations and Examples
	– *literary writing* provides aesthetic pleasure for the writer or audience; entertains The forms or modes of writing from which students may choose include the following: – *narrative writing* tells a story; encompasses changes over a period of time – *descriptive writing* describes people, places, and things as they are at one point in time (like a snapshot) – *classificatory writing* orders events and things through comparison and classification – *evaluative writing* measures or judges according to a standard **Examples** • Allow students to explore home economics content by writing to achieve various purposes. Students may complete writing assignments such as the following: – Keep a diary tracking interpersonal relationships. – Write an informative article on the major types of apparel advertising. – Write a series of television advertisements persuading peers to make choices that contribute to a healthy lifestyle. – Write a short story or soap opera plot relating potential family problems and crises. • Provide opportunities for students to write in multiple modes. Examples of writing assignments include the following: – Write a biographical sketch of an elderly person in the community. Share the sketch with the class and analyze housing, health care, and nutritional options elderly persons must face. – Compose a classified advertisement describing a career in hospitality services. – Write a report classifying properties of natural and manufactured fibers according to physical, chemical, and environmental properties. – Write an essay examining dysfunctional or abusive behavior toward children in families.

Table 15 – continued

Use the Composing Process in Writing	
Concepts	**Explanations and Examples**
Revise and refine compositions using self-assessment, peer interaction, conferences, and individualized techniques.	**Example** • Encourage students to read compositions carefully and make corrections and revisions to clarify, increase understanding, and improve the product. When appropriate, allow students to conference with a teacher or one or more peers.
Proofread written work for internal punctuation errors, spelling errors, grammatical and syntactical errors, correct paragraph indentation, correct margins, and legibility of writing.	**Example** • Encourage students to proofread and edit compositions for mechanical correctness. Have students use dictionaries to check spelling. Students may use Teaching Aid 7, Writing Checklist, or a checklist suggested by the school's language arts department as a tool when proofreading.
Evaluate content, organization, topic development, transition, clarity of language, and word and sentence variety according to the intended purpose and audience of the composition. Evaluate one's own writing as well as that of others.	**Example** • In addition to traditional, written evaluation of compositions by the teacher, intersperse use of teacher/student conferencing, peer evaluation, and self-evaluation as discussed in the "Teaching and Evaluation Strategies" section of this book.
Share written products in a variety of ways.	**Example** • Sharing final written products provides verbal practice and exposure to the writing styles of others. Give students opportunities to share their writing in ways such as the following: – Share written products in small groups. – Exchange compositions for critiquing (be sure students understand principles of providing constructive feedback). – Read written products to the class or other groups. – Publish compositions in a school or local newspaper or newsletter.

Table 15 – continued

Demonstrate the Use of Conventional Writing and Language Skills	
Concepts	**Explanations and Examples**
Use the forms and conventions of written language appropriately.	**Explanation** • Forms of writing include narrative, descriptive, classificatory, and evaluative (see page 84). The *conventions of language* are those tools that make language consistent and understandable, such as mechanics of grammar and usage, spelling, and handwriting. **Example** • As teachers provide repeated writing practice for varying purposes, students' ranges of skills in using conventions of language increase.
Choose appropriate words to convey intended meaning. **Vary word and sentence choice for purpose and audience.**	**Example** • Remind students to consider the purpose, audience, and form, as well as the mood and tone desired, in making word choices. Encourage students to use the dictionary and thesaurus when writing. Reinforce word skills by introducing new vocabulary terms with new home economics content.
Demonstrate facility with word analogies and other forms of advanced vocabulary development.	**Explanation** • *Word analogies* consist of words that are similar or related in some way. Standardized tests often present pairs of words and ask students to identify the relationship and substitute another pair of words similarly related. A sample word analogy is *secretary:typewriter*. A secretary uses a typewriter to perform job tasks. The analogy *photographer:camera* is similarly related. **Example** • Incorporate word analogies in a learning experience on home economics careers. Give students a sample analogy, such as *nutrition:dietician*, and ask them to fill in the blanks on other analogies such as *clothing:*____ and *parenting:*____. As students research careers, have them develop their own analogies to share with the class.

Table 16

Demonstrate the Use of Conventional Writing and Language Skills	
Concepts	**Explanations and Examples**
Recognize the meanings and appropriate uses of colloquialism, slang, idiom, and jargon.	**Explanation** • Types of specialized language include the following: – *Colloquialism* is familiar language used in everyday conversation, as opposed to formal speech or writing. The phrase *I really goofed up* is colloquial while *I erred* is formal. – *Slang* is informal language consisting of popular or faddish words and phrases that are usually short-lived. *Far out* is outdated slang; *radical* is a more current slang expression. – An *idiom* is an expression whose meaning differs from its actual, literal definition. *Kick the bucket* is an example. – *Jargon* is specialized language or vocabulary peculiar to a particular group or profession. Terms such as *icon*, *PC*, and *output* are computer jargon. **Example** • Use of informal or specialized language is appropriate for certain purposes and audiences. Guide students in practicing and learning when to properly use specialized language. Use of informal language in an inappropriate setting, for example, can be detrimental to employability; the use of informal language during a job interview is not appropriate. As students role play a job interview, point out any inappropriate expressions; explain that the expressions are not wrong and might be appropriate in casual conversation. Examples of colloquialism, slang, idiom, and jargon also can provide a basis for analyzing cultural differences, sexual misconceptions, and communication barriers between age groups. Ask students to list expressions they use that their parents misunderstand. For example, what does it mean to say something is bad?
Use all parts of speech effectively in sentences.	**Explanation** • Parts of speech are defined as follows: – A *noun* names a person, place, thing, or idea. – A *pronoun* takes the place of one or more nouns. – A *verb* expresses action or style; an *action verb* names an action while a *linking verb* tells what the subject is or is like. – An *adjective* describes a noun or pronoun. – An *adverb* describes a verb, adjective, or another adverb. – A *preposition* relates a noun or pronoun to another word. – A *conjunction* connects words or groups of words. – An *interjection* expresses surprise or strong feeling.

Table 16 – continued

Demonstrate the Use of Conventional Writing and Language Skills	
Concepts	**Explanations and Examples**
	Example • Remind students that effective communication depends on correct use of the parts of speech. Assist individual students as necessary to correct basic skill deficiencies in this area, utilizing resources available for remedial instruction. A poster or other visual reviewing the parts of speech can assist students as they write and can reinforce the importance of the concepts students are learning in academic courses.
Use a variety of sentence structures including simple, compound, and complex.	**Explanation** • Types of sentence structures include the following: – A *simple sentence* has one subject and one predicate part. Example: Terry is a junior at State High School. – A *compound sentence* consists of two or more simple sentences joined by a conjunction; it has at least two subjects and two predicates. Example: He enjoys caring for children, and he is taking Advanced Child Development. – A *complex sentence* has an independent clause and a subordinate clause. Example: Because Terry has received vocational training, he was able to get a summer job in a child care center. **Example** • If a student writes fairly effectively but uses all simple sentences, assign the student to rewrite using a mixture of sentence structures or encourage the student to vary sentence structures on future assignments. A visual aid reviewing sentence structures might encourage students to expand their structural styles.
Refine sentences and paragraphs into compositions exhibiting unity, clarity, and coherence.	**Explanation** • A *paragraph* is a group of sentences that explains one idea. Each paragraph includes a topic sentence, which states the main idea and is usually the first sentence. The remaining sentences add meaning to the main idea by giving details, examples, or supporting incidents. Types of paragraphs are as follows: – A *narrative paragraph* tells a story. – A *descriptive paragraph* describes or tells what happened. – An *explanatory/expository paragraph* explains, informs, or gives directions. A type of explanatory paragraph is the *persuasive paragraph*, which expresses and supports a personal opinion, attempting to persuade others to honor or embrace the opinion.

Table 16 – continued

Demonstrate the Use of Conventional Writing and Language Skills	
Concepts	**Explanations and Examples**
	Example • Younger students or those with lower skill levels will first need to master paragraphs before writing longer compositions. Students might write stories, consisting of a few paragraphs, discussing experiences that built self-esteem or giving directions for evaluating the traffic pattern in a room.
Write longer compositions incorporating outside information with documentation.	**Explanation** • A *composition* consists of many paragraphs that collectively support a main idea. A composition includes an introductory paragraph, body paragraphs, and a conclusion paragraph. **Example** • Provide opportunities for students to complete challenging writing assignments appropriate to their skill levels. Paragraphs or essays may challenge some students while documented research papers might provide more skilled students with excellent integrated learning in both home economics content and writing skills. For all written products, provide teacher, peer, or self-evaluation processes to strengthen communication of the product's meaning.
Make language choices to convey tone and mood, as well as ideas.	**Explanation** • *Tone* is the attitude toward the subject conveyed by the author or speaker. *Mood* is the specific feeling or atmosphere suggested by the discourse. **Example** • As students write for various purposes and audiences, point out how styles change. Divide students into groups to research a specific topic, such as housing career options available in the community. Have each group write about their findings using one of the following forms: – a letter to a friend who is interested in a summer job in an interior design store – a formal essay – a speech to present at an FHA/HERO meeting – a skit to present to another class – an article for the school paper As students orally share their findings, point out how the same information can be relayed in differing forms to differing audiences and how the tone and mood vary accordingly.

Table 16 – continued

Demonstrate the Use of Conventional Writing and Language Skills	
Concepts	**Explanations and Examples**
Produce oral discourse and share written discourse orally.	**Example** • Provide multiple, varied opportunities for students to share written discourse with classmates, parents, other teachers, and as many other individuals or groups as possible. In producing oral discourse, students should employ the same considerations used in making word and language choices, considering purpose, audience, and form.
Use oral language effectively in a variety of situations.	**Example** • Provide multiple, varied opportunities for students to speak in small and large groups. Oral reports, group discussion, and class discussion are means of incorporating content and speaking skills. FHA/ HERO and other leadership and extracurricular activities provide experience in oral communication. By encouraging and assisting students to communicate effectively orally, teachers empower those students to achieve both academically and personally.

Table 16 – continued

Construct Meaning from Written and Oral Text

Concepts	Explanations and Examples
Expand vocabulary by determining word meanings through context clues and use of specialized dictionaries.	**Explanation** • *Inference* is the process of deriving meaning from a word's immediate context or structure. Clues within a passage can often help define a word. The structure of a word also may help determine the meaning of the word. Word parts include the base word, prefixes, and suffixes. If a student is familiar with the word *fattening*, the meaning of *nonfattening* can easily be inferred. **Example** • When students are introduced to new content, provide opportunities to determine meanings of new words, based on context clues and previous learning or use of dictionaries. Have students develop vocabulary lists as they read assigned material; compile and discuss the lists and definitions as a class. Include discussion of word origin, key word parts, and related words to further expand vocabulary development.
Identify the stated or implied main idea of a selection and express the main idea in one sentence.	**Example** • As students read and study assigned text, have them summarize the main ideas of sections orally or in writing. The goal is to teach students to read for meaning and personal understanding, which enables them subsequently to apply, synthesize, and evaluate information.
Recognize relevant details.	**Example** • In addition to identifying main ideas, students must be able to recognize relevant details. After students have read a chapter or listened to a lecture on family health and safety, have them share orally or in writing the main ideas and the most important points of the text.
Identify the sequential order of events. **Perceive cause and effect relationships.**	**Example** • The *sequential order of events* refers to the sequence in which events in the time line of a discourse occur. Events may not be related in the order of occurrence, and students must be able to distinguish actual sequence in order to achieve meaningful understanding. Proper sequential order is essential to perception of cause and effect relationships. As students study nutrition, they learn that poor diet causes negative effects; as they study personal development, they realize that positive self-image contributes to success; and as they study family health, they learn that prolonged, excessive stress has physical effects on individuals. Key words such as *because* and *since* are clues that a cause and effect relationship exists.

Table 17

Construct Meaning from Written and Oral Text	
Concepts	**Explanations and Examples**
Recognize and evaluate the author's point of view.	**Explanation** • The *point of view* is the perspective through which the narrator writes. In *first person*, the narrator is a participant in the story and writes from the viewpoint of *I*. In *third person*, the narrator tells the story as an outsider, using third person pronouns such as *he*, *she*, and *they*. **Example** • Give a hypothetical, emotional situation to students studying interpersonal relations at home or work. Ask students to write in first person about the feelings of one character and in third person about the projected feelings of the other characters.
Distinguish between fact and opinion, grounded and ungrounded belief, and rational thought and rationalization.	**Explanation** • A *fact* is a statement that can be proven to be true; *opinion* is a statement that cannot be proven but expresses belief. *Grounded belief* is based on reason and critical evaluation; *ungrounded belief* is based on emotion or hearsay rather than rational thought processes. *Rational thought* is based on reason; *rationalization* is false reasoning made up to explain an action or opinion. **Example** • Give students a set of statements related to a highly publicized topic such as AIDS, teen pregnancy, or latchkey children. Have them classify each statement as fact or opinion or as grounded or ungrounded belief and explain reasons for the classifications. Look for opportunities during class discussions to lead students to differentiate between the categories.
Recognize different forms of propaganda.	**Explanation** • *Propaganda* is the systematic spread of ideas to promote one's cause or damage an opposing cause, or the ideas spread through such systematic means. The term often refers to distortion or deception since propaganda is usually slanted to support one viewpoint. Propaganda typically appeals to emotion rather than reason in order to generate strong feelings leading one to adopt a particular viewpoint. Examples of emotional propaganda techniques include the following: – A *bandwagon approach* plays on the desire to be part of a group; for example, "Everyone else has or does this."

Table 17 – continued

Construct Meaning from Written and Oral Text	
Concepts	**Explanations and Examples**
	– *Loaded language* is strong, connotative language that may be positive (words like *beautiful* or *sweet*) or negative (words like *stupid* or *ugly*); these words generate certain emotions regardless of context. – In a *testimonial approach*, a famous or respected person promotes or speaks against something. – *Transfer* is a technique that takes positive or negative feelings in one area of life and leads a person to transfer those feelings to something else. – *Exigency* is a sense of urgency to decide immediately, without adequate time to reason; for example, "Decide now, or the opportunity of a lifetime will be lost." – *Innuendo* insinuates or hints at something, usually derogatory, about a person; political opponents sometimes employ innuendo. Other forms of propaganda are based on errors in reasoning. These include the following: – A *generalization* is a statement about one or more members of a group that is supposedly true of all members of the group. – A *stereotype* is a broad and unfair generalization about a particular group. – *Red herring* is an idea planted to divert attention from the main idea – a misleading clue. **Example** • Students need to recognize that many different forms of propaganda abound in media and personal messages. To be healthy and productive citizens, students must be able to recognize propaganda techniques, to resist negative media and personal messages, and to think critically and form independent judgments. A discussion of marketing and advertising techniques in consumer economics might include examples of propaganda such as a sports hero promoting expensive athletic shoes (testimonial) or a hamburger chain that markets food by advertising the emotional appeal of family and friends (transfer). Values, cultural and ethnic differences, and family and parenting issues often are targets of propaganda and provide opportunities for investigation of propaganda techniques and exercise in critical thinking.

Table 17 – continued

Construct Meaning from Written and Oral Text	
Concepts	**Explanations and Examples**
Evaluate and make judgments.	**Example** • To assume self-responsibility and to become responsible employees, parents, family members, and members of society, students must learn to think critically, make decisions, and form judgments based on fact, grounded belief, and rational thought. Discussions and opinion papers on topics such as substance abuse, adolescent pregnancy, advertising claims, and specific media messages can form the basis for development of critical thinking skills. Critical thinking strategies are discussed more extensively in the "Teaching and Evaluation Strategies" section of this book.
Make written notes while avoiding plagiarism.	**Example** • Taking notes from written or oral text helps students organize and remember information for future reference and when studying for tests. Encourage students to take notes in an organized form in notebooks, with pages appropriately labelled, or on note or bibliography cards when writing research papers. Key ideas, words, and definitions should be recorded. Notes should be clear and concise. They need not be in complete sentences; phrases, abbreviations, and symbols are acceptable if they are legible. Taking notes in one's own words helps to avoid plagiarism in subsequent writing based on noted information.
Interpret complex maps, charts, and tables.	**Example** • In this age of technology, vast amounts of information are summarized and presented graphically. Provide opportunities for students to analyze graphic information, including tables and lists, charts and graphs, maps and globes, and diagrams and pictures. Nutritional data, family statistics, and economic figures and projections typify home economics data that is presented in graphic form.
Develop study strategies.	**Explanation** • The format and organization of a book can be helpful when locating information. Reference materials such as dictionaries, atlases, encyclopedias, almanacs, and bibliographies may be used to locate information. Students can develop study strategies by following complex directions and preparing for subject area assignments. Reading procedures, techniques, and rates should be adjusted according to purpose.

Table 17 – continued

Construct Meaning from Written and Oral Text	
Concepts	**Explanations and Examples**
	Examples • When assigning study or research, review with students how to locate and use various parts of a book, including the table of contents, index, glossary, preface, footnotes, appendices, and cross-references. • Have students work independently or in groups to locate assigned information. Keep good reference materials in the classroom, referring students to the school or public library for further sources. • Provide practice in following complex directions. Have students follow directions for complex recipes or laboratory procedures. • Depending on the purpose of their reading, students may use one of the following techniques: – *scan* Quickly overview material, moving the eyes quickly over pages and noting titles, subtitles, and main headings. – *skim* Quickly locate specific pieces of information, such as a definition or fact. – *read in depth* Read word-for-word, taking time to read each word and pay attention to details. Students need expertise in all three reading techniques. • The SQ3R study method is broadly taught to students as a means of preparing for subject area assignments. The SQ3R method consists of the following five steps: 1) survey Look over the assignment before beginning; check the title, headings, and charts for a general overview of the material. 2) question Read study questions or formulate questions to be answered. 3) read Read the material, paying close attention to main points and skimming less important points. 4) recite Repeat or say aloud main points and answers to formulated questions. 5) review Go over main points and answers to questions without using notes.

Table 17 – continued

Use Meaningful, Culturally Valuable Literature Selections	
Concepts	**Explanations and Examples**
Understand and analyze the major differences among various literary genres.	**Explanation** • A *genre* is a class or category of literature differentiated by form or technique. Literary genres include fiction, nonfiction, biography, autobiography, myth, legend, fable, folk tale, poem, drama, play, diary, journal, and short story. **Example** • Have students read portions of a novel and discuss decision-making techniques that led to cause and effect relationships and how different decisions might have affected the outcomes. Reports on various types of family structures might stem from reading nonfiction selections. Consult a librarian or language arts teacher for suggestions of varied literary choices appropriate for specific home economics content.
Recognize cultural attitudes and customs in literary selections.	**Example** • Have students read and share poems, short stories, and other literary selections that reflect cultural practices and customs. A drama depicting cultural attitudes could provide a program for an FHA/HERO function.
Understand and analyze language used denotatively and connotatively in literary selections.	**Explanation** • *Connotation* is the emotional meaning suggested by a word or group of words. *Denotation* is the literal, clear-cut definition. **Example** • Denotative language is that used in factual, objective presentations of material, such as in a textbook. Connotative language is used to elicit positive or negative feeling or to persuade. In order for students to evaluate and make sound judgments, they should be able to recognize the differences in these two types of language. Have students analyze product claims. For example, ask students to determine which of the following statements elicits the more positive response: – fortified with essential nutrients – vitamins added Have students look for similar statements that have virtually the same meaning but promote a product through connotation.

Table 18

Use Meaningful, Culturally Valuable Literature Selections	
Concepts	**Explanations and Examples**
Understand and analyze major types of sound devices and figurative language as they contribute to meaning.	**Explanation** • Major types of sound devices include the following: – *Rhyme* is the repetition of the same sound at the ends of words. – *Rhythm* is a pattern of stressed and unstressed syllables. – *Alliteration* is repetition of the same sound at the beginnings of words. – *Onomatopoeia* is the formation of words that imitate the sounds they name. Figurative language employs words in special ways to add to meaning. Figures of speech include the following: – A *simile* is a comparison of two different things using *like* or *as*. – A *metaphor* is a comparison of two different things without using *like* or *as*. – *Personification* is the giving of human qualities to an inanimate object or idea. **Example** • Have child development students collect examples of children's literature that employ various sound devices and read the literature to children in a child development laboratory. Have students record examples of figurative language used by children. In a family life class, discuss figurative language peculiar to various cultures.
Use basic literary terminology. **Identify irony, tone, mood, allusion, and symbolism in literary selections.**	**Explanation** • Basic literary terminology includes the following: – *Irony* is contrast between an expected and actual occurrence. – *Tone* is the author's attitude toward a subject. – *Mood* is the specific feeling or atmosphere suggested by a discourse. – *Allusion* is a reference to a well-known person, event, or selection of literature. – *Symbolism* is the use of one thing to represent something else. **Example** • Be aware of basic literary terminology, techniques, and elements. When an example arises in students' reading or in children's literature, provide reinforcement by pointing out and appropriately labelling the literary device.

Table 18 – continued

Use Meaningful, Culturally Valuable Literature Selections	
Concepts	**Explanations and Examples**
Understand and analyze the elements of fiction as they contribute to meaning. **Recognize the development of an overall theme in a literary work.**	**Explanation** • The main elements of fiction include the following: – *plot* the series of events that take place – *setting* the time and place – *characters* persons who participate in the action – *theme* the main idea or message of the selection **Example** • Have students write fictional short stories about families living in the twenty-first century, basing the stories on trends discussed in family life, family health, employment, and other related areas. Have students summarize the plots, settings, characters, and themes of other students' stories.
Broaden and deepen personal experience through imaginative and emotional engagement with literature.	**Example** • As students become acquainted with various literary genres, their experiences are broadened and deepened beyond the confines of their personal worlds. Their imaginations are stimulated to explore other points of view and new possibilities for their own lives. Students can learn about family life and parenting practices in other cultures and settings; they can learn about food, housing, economic, and health issues they might never experience otherwise. Engagement with literature can provide a lifelong means of recreation, stress management, and learning.

Table 18 – continued

Learning and Evaluation Experiences

Introduction

The first steps in integrating academic and vocational learning are knowing the fundamental academic principles and developing ways to reinforce them effectively while teaching specific course content. While accomplishing these goals, it is vitally important that teachers **make a point of identifying the academic principles being reinforced** so that students, parents, administrators, the public, and other professionals recognize that integration is being accomplished.

In the following learning and evaluation experiences, suggestions are given for applying principles of mathematics, science, and language arts to specific home economics content areas. In some experiences, it is suggested that the teacher point out to students that specific academic principles are being reinforced. To conserve space and avoid redundancy, this specific suggestion is not repeated in experiences containing academic principles that are easily identifiable; however, it is essential to point out to students that specific academic principles are being reinforced in each learning and evaluation experience. Unless academic principles are consistently identified for students, they may never realize that the principles are being applied.

Take credit for academic integration. Identify principles being reinforced!

Child Development

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the area of child development, refer to *Parenting and Child Development*; *Advanced Child Development*; *Pregnant and Parenting Adolescents*; *Parenting Education for School-Age Parents*; and *Child Care and Guidance, Management, and Services*. These books are available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Obtain a chart used by pediatricians to record and analyze children's heights and weights. Have students plot the heights and weights of children in a child development laboratory or of other young children; verify the graphs for accuracy. Lead a class discussion on physical growth of children. Point out to students that they are applying mathematics principles related to charts, graphs, predictions, and probability. KEY QUESTIONS: Why do physicians measure and track height and weight of children? How are height and weight data used to predict a child's adult height and weight? What factors determine a specific child's height and weight? How does plotting data in graphic form make the data easier to interpret and track? What might plotting such data over a period of months or years reveal about an individual child's growth?

Have students prepare learning activities for preschool children designed to build mathematics skills and share the activities with the class. For example, students might cut out figures, construct puzzles, or collect objects representing basic geometric shapes. They might plan an activity involving grouping objects and adding or taking away to demonstrate more or less. Students might consult an elementary mathematics teacher or a child care provider for ideas. Guide the class in constructing a chart showing mathematics activities appropriate for children of different age levels.

Assign an entrepreneurial project of exploring the costs of opening a child care center. Provide local requirements regarding space and number of employees required per child and estimate local cost per square foot to lease commercial building space. Have students compile preliminary figures as they would present them to a banker to obtain financing, figuring monthly cost of a building based on cost per square foot multiplied by square footage required for a certain number of children, estimated wages multiplied by number of employees needed, and income projected for the same time period. Lead a class discussion on other factors and costs to be considered before approaching a loan source for financing. Remind students that mathematics principles are essential to operation of a business. KEY QUESTIONS: What fixed costs might be involved in operating a child care center? What variable costs might be involved? How can income be estimated? CRITICAL QUESTION: Why is it necessary to do a ***break-even analysis***, a computation to determine when costs and income balance?

Science

Have students compile a booklet of nutritious snacks and meals for young children. Guide students in consulting nutrition tables, found in the back of most food science and nutrition textbooks, to evaluate the nutritive value of each snack or meal and adapt as needed to increase nutritional value or appeal to children. The resulting compilation could be printed and marketed as a fund-raising project for FHA/HERO or shared with community members as a service project.

Invite the school nurse to explain normal body temperature, causes and effects of fever, and action to take when children have fever. Through questioning, lead the class to explore science principles related to body temperature. KEY QUESTIONS: How does the body maintain its normal temperature range? How does perspiration lower body temperature? What causes fever? How does sponging a feverish child lower body temperature?

Lead the class in an experiment to discover how super-absorbent diapers absorb moisture. Divide the class into groups. Have each group do as follows:

- Cut a super-absorbent diaper into pieces, place the pieces in a bag, and shake the bag to release the material inside the diaper.
- Place the material in a styrofoam cup; weigh the cup before and after placing material inside and determine and record the mass of the material.
- Pour a small amount of water into the cup, shake gently, and invert the cup to see if the material and absorbed water remain in the cup.
- Continue the pouring, shaking, and inverting process until water does not remain in the cup when inverted.
- Measure the mass of the cup, water, and material to determine the mass of water held by the super-absorbent material.

Have each group record and discuss their conclusions. KEY QUESTIONS: What is the ratio of the mass of material to the mass of water absorbed? In what form was the material after absorbing the water? What chemical material was used in the diaper to absorb the water? What are chemicals called that absorb water? How does use of these chemicals in disposable diapers benefit infants?

Language Arts

Assign students to research the effects of practices such as substance abuse, poor diet, and lack of rest on the prenatal development of infants. Have students present findings in creative compositions directed to varied audiences. Compositions may be written in the following forms:

- a letter to a pregnant friend warning of harmful effects
- an editorial
- a speech to present to a formal audience
- a "Dear Abby" column

Encourage students to use their imaginations in selecting mediums and to adapt their writing styles to the audiences selected. Have students orally share their compositions. Be sure students recognize the application of language arts principles; they are planning and composing for a variety of purposes and audiences and sharing discourse orally.

Have students collect examples of children's literature employing various sound devices such as rhyme, rhythm, alliteration, and onomatopoeia (see page 97 for definitions of each). Ask students to read the literary selections to children at home or in a child development laboratory and report to the class which are children's favorites and the differences noted in the way children of various ages responded to the selections.

With the class, list types of alternative child care available in the community. Divide the list among individual students. Have students analyze the types of child care and report to the class. Have each student summarize the reports by writing an informative newspaper article describing child care options and discussing advantages and disadvantages of each. Lead a class discussion on the articles. Encourage students to use the composing process in writing and to consider appropriate means of sharing resulting articles with selected audiences. NOTE: Results of this experience could be compiled, printed, and shared with members of a parenting class or parents at an FHA/HERO or PTA meeting. KEY QUESTIONS: How can parents discover the options available for child care? What factors influence choice of child care? How does being a single parent affect decisions regarding child care? CRITICAL QUESTION: What resources can parents utilize to evaluate the child care facilities identified?

Mathematics
Language Arts

Divide the class into groups. As a cooperative learning experience, have each group estimate the cost of rearing a child from birth to age eighteen. Have students look up figures and interview parents to obtain information. Have each group report their findings to the class, depicting information in graphic form, such as tables, charts, pictographs, or line, bar, or circle graphs. Identify the use of graphic forms as essential mathematics and language arts skills. Lead a class discussion on the financial impact of children on a family. KEY QUESTIONS: What items and services are involved in the cost of rearing a child? What range of costs, from low to high, was identified in the group research and interviews? Based on group findings, what is the mean cost of rearing a child from birth to age eighteen? CRITICAL QUESTION: Why is it important to recognize the financial impact of a child on a family?

Science
Language Arts

Invite a biology teacher to teach a lesson on genetics, including concepts such as the following:
- dominant and recessive genes
- chromosomes
- sex-linked traits
- genetic defects

Have students outline important points presented during the lesson and choose one concept to research in more depth and report to the class. KEY QUESTIONS: In what ways do mathematical concepts of probability relate to genetics? How does knowing one's genetic history affect parenting and health decisions?

Assign groups of students to develop charts listing common hazardous household chemicals and describing antidotes and first aid methods for each. Lead a class discussion on safety practices to follow to prevent children from contacting hazardous chemicals and first aid practices to follow when accidents occur. KEY QUESTIONS: What precautions should be taken to prevent children from being harmed by hazardous household chemicals? What first aid supplies should be readily available in the event of a household chemical emergency? Where might first aid procedures and critical phone numbers be posted for emergency reference by a parent or child caregiver?

Consumer Economics

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts principles in the area of consumer economics, refer to *Consumer and Family Economics*, which is available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Present an overview of types of spending plans and record keeping systems used by families and individuals. Have each student select one type of spending plan or record keeping system to use for one month in planning and recording expenditures according to specific categories of expenses. At the end of the month, have students total amounts budgeted and amounts spent, compare the two sets of figures, analyze discrepancies, and then share their projects with classmates in oral reports. Guide students in analyzing the effectiveness of the spending plans and record keeping systems chosen and make constructive suggestions for improvements.

Have students complete Teaching Aid 8, Comparison Shopping, to exercise comparison shopping skills or develop a similar teaching aid using items especially relevant to the class. Allow students to use calculators where desired. Point out to students that in completing this exercise, they have used computational skills, reasoning skills, and measurement skills.

Invite an automobile salesperson to discuss with the class the cost of purchasing and financing a car. Ask the guest to discuss the following:
- estimated costs of students' favorite models of cars
- financing options and costs
- estimated down payments required, resulting monthly payments for x number of months, and extra costs such as sales tax, license, and insurance

Have students summarize insights gained from the presentation.

Science

Have teams of students design experiments comparing two or more similar products varying in brand name, price, or purchase location. For example, one team might select three pairs of tennis shoes: one discount store brand, one department store brand, and one nationally advertised brand from a specialty athletic store. If students hypothesize that the more expensive brand is more durable, guide them to design a means to test durability, record observations and results, and report findings to the class. Food products, clothing, stereos, and jewelry exemplify other items that might be selected. Remind students that the scientific method demands objectivity and honesty, careful methods, logical reasoning, and accurate and unbiased results.

Language Arts

Distribute copies of warranties and guarantees to students. Have each student read and verbally analyze the extent of protection and recourse offered by a given warranty or guarantee. Lead a class discussion on the warranties and guarantees. Emphasize that a knowledgeable consumer must possess strong language skills. KEY QUESTIONS: What protection is guaranteed? What is the length of the warranty? What exclusions or limits apply? What type of information is provided on how to obtain service? Where can the product be serviced? What costs would the purchaser incur, such as freight, cartage, or mileage?

Lead students to brainstorm to identify different forms of propaganda used in advertising (refer to pages 92 and 93). After listing the propaganda techniques, assign students to note examples observed in media advertising during the week. At the end of the observation period, have students share examples and then lead a class discussion on how to evaluate advertising and base consumer decisions on rational thinking rather than emotional appeal. Point out and discuss any examples of fraudulent advertising that are presented.

Lead students to brainstorm to describe situations in which a letter of complaint is needed. Have each student select one situation and compose a complaint letter. If necessary, review fundamentals of writing letters. Critique the letters for content and persuasiveness, grammar, and correct letter form. Have students rewrite as necessary.

Mathematics
Language Arts

From a finance company, obtain charts or tables for estimating monthly payments for dollar amounts of purchases. Give each student a cost figure. Instruct each student to estimate the monthly payment amount according to the table, multiply by the total number of months to determine the total amount to be paid, and compare the total to the initial cash purchase price. KEY QUESTIONS: What is the resulting interest cost for the total number of months? What is the interest rate on the purchase? CRITICAL QUESTION: What factors should be considered when deciding whether to finance a purchase or pay cash?

Overview responsible management of personal checking accounts. Points to cover include the following:
- advantages of checking accounts
- examples of checking account forms
- correct procedures for filling out checks and deposit slips
- methods for maintaining a checkbook register
- procedures for reconciling a bank statement

Have students practice filling out checks and deposit slips, placing entries in a checkbook register, and maintaining a balance in a checkbook register. Encourage students to do calculations both with and without calculators and remind students that they are practicing essential mathematics skills.

Family Health

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the area of family health, refer to *Family/Individual Health* and *Families with Special Health Needs*. These books are available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Ask a nurse to explain to students how pulse rate is measured and what constitutes a normal pulse rate range. Have students make charts and record their own pulse rates when sitting in class, after running two minutes in place, and after two minutes at rest. Guide students in computing the percentage of increase and decrease in pulse rates after each activity. Point out to students that in completing this activity they are applying mathematics principles related to measurement, construction of charts, and percentages.

Assign students to tape interviews with health care workers to find out what mathematics and science skills are required in the occupational field of health care. Play the interviews for students and have them develop a chart of health care occupations and related academic skills. For example, many health care workers prepare solutions to be administered as medication or used in laboratory tests. They apply ratios and proportions to mix the solute or drug with the solution, usually water, to achieve the required strength. A 1:6 solution means one part solute or drug to six parts of solution. If eighteen parts of solution are required, the amount of solute can be determined as follows: $1/6 = x/18$, $6x = 18$, and $x = 3$ parts solute required.

Science

Have students bring copies of popular weight-loss diets to class. Divide the class into groups and assign each group one diet to analyze. The analyses might include the following:
- a nutritional evaluation
- comparison of caloric content with calorie recommendations
- predicted effects of following the diet for one month, including possible negative side effects

Have each group report their analysis to the class and present a group recommendation regarding the advisability of following the diet. Emphasize to students the importance of using science skills such as rational and critical thinking as the basis for inferences and actions.

Have the class define *disease*. On one side of a poster, have students list possible causes of disease. Diseases may be genetic, communicable, and sexually transmitted. They may also be caused by prolonged excess stress and lifestyle choices such as substance abuse and poor eating habits. On the other side of the poster, have students list means of disease prevention. Quiz students regarding causes and prevention of disease. KEY QUESTIONS: What are examples of genetically transmitted diseases? How can genetic counseling help persons deal with genetic diseases? In what ways are communicable diseases transmitted? What practices can reduce the spread of communicable diseases? How are sexually transmitted diseases (STDs) transmitted? How can the contraction of STDs be prevented? What diseases may be caused by substance abuse? How can poor eating habits contribute to disease? What is the relationship of prolonged, excess stress to disease? What practices enable one to cope with stress and reduce adverse health effects? CRITICAL QUESTION: How do lifestyle choices affect an individual's overall risk of contracting or accelerating disease?

Conduct a class experiment to illustrate how skin protects the human body and how simple first aid procedures can prevent infection. Provide three apples. Label the apples number one, number two, and number three. Puncture apple number one with a sterile needle and apply antiseptic. Puncture apple number two with a dirty needle that has been dipped in dirt or scraped on the floor and leave untreated. Let apple number three serve as the control apple. Over a period of several days, have students observe and record any changes that occur in the areas where the apples were punctured. Cut the apples to see the extent of spoilage around the punctured areas. Lead students to infer how apple peel, like human skin, protects sensitive areas under the skin from harmful bacteria and how penetrations of that protective layer should be treated. KEY QUESTIONS: What is the function of the human skin? At the end of the experiment, how did the apple punctured with the sterile needle differ from the apple punctured with the dirty needle? How might the differences be explained? CRITICAL QUESTION: What conclusions might be drawn regarding hygiene and simple first aid procedures?

Language Arts

Have students work cooperatively in groups to prepare presentations on techniques for effectively managing stress. Each group should research suggested means of managing stress, decide on a creative method of orally sharing information with the class, and prepare and present the presentation. Flip charts, audio tapes, videotapes, skits, and overhead transparencies containing lists, sketches, or cartoon characters may be used during the presentations. After the presentations, have students summarize and outline effective stress management techniques. Point out to students that language competence includes sharing oral and written products in a variety of ways.

Ask a language arts teacher to explain how reading literature can be used in managing stress. Record the explanation on audio tape and have students listen to the tape. Lead students in sharing examples of literary genres they find enjoyable and in discussing benefits of reading for enjoyment. KEY QUESTIONS: How might reading for relaxation and pleasure benefit various body systems? How might reading improve mental attitude? Why does the human body require periods of relaxation? What suggestions can students offer to encourage each other to read for pleasure? CRITICAL QUESTION: Why is the practice of cultivating an enjoyable hobby, such as reading, an effective method of coping with stress?

As a cooperative learning experience, have groups of students write, produce, and present public service advertisements discouraging substance abuse. Arrange for presentations chosen by the class to be presented at a school assembly.

Mathematics
Science

Have each student record the number of hours slept per day for a period of seven to ten days, graph the hours recorded, and compute the mean number of hours slept. Refer students to Teaching Aid 4, Frequency Tables, Charts, and Graphs, for examples of graphic instruments. Lead a class discussion on the displayed graphs. KEY QUESTIONS: How do the graphs and means vary among students? How much sleep is needed by an individual? Does everyone need the same amount of sleep? Why? What are the results of too little sleep?

Display several types of clinical thermometers and allow students to examine them. Ask the school nurse to discuss and demonstrate correct procedures to follow in selecting, using, reading, cleaning, and sterilizing thermometers and to guide students in practicing taking temperatures and accurately reading thermometers. Stress the importance of sanitation during the practice by having students sterilize the thermometers after each use. Note that accurate measurement and correct use of equipment are fundamental mathematics and science skills. KEY QUESTIONS: What types of clinical thermometers are available? What factors determine which type to use in a specific situation? How does accuracy of measurement vary with the thermometer type and measurement technique used? What steps should be followed in preparing and using a thermometer? What procedures are used to clean and sterilize thermometers? Why is sterilization essential?

Provide small groups of students with samples of medication labels supplied by a pharmacist or removed from empty medicine containers. Have the groups analyze the labels and be prepared to identify pertinent information and demonstrate the ability to measure correct dosages and explain exactly when and how the medication should be administered to a specified family member. Include examples of labels that specify dosage amount according to the weight of a child and have students calculate the correct dosage for a child of specified age and weight. Reinforce the importance of care and accuracy in following the directions on medications. KEY QUESTIONS: What information is included on medication labels? How does label information on prescription drugs differ from that on over-the-counter (OTC) drugs? Why is it imperative that the correct prescription medication be administered to the specified person at the right time in the proper dosage? What techniques ensure accuracy in measuring medication? CRITICAL QUESTION: What consequences can result from inaccurate or improper administration of medication?

Mathematics
Language Arts

Divide the class into groups to research the costs of medical care in selected situations such as the following:

- daily cost of hospital confinement
- major surgery and hospitalization for one week
- emergency room visit for treatment of a broken arm
- hospitalization and treatment for an illness extending over a period of several months

Students may choose other specific situations of interest to their groups. Have each group practice language skills by orally sharing their report with the class, using charts or graphs to illustrate costs. Point out how mathematics concepts have been applied in computing medical costs.

Science
Language Arts

Lead a class discussion on how predictions regarding present and future health often can be made based on one's lifestyle and family history. Have one student draw two columns on a large sheet of paper and list lifestyles or hereditary factors discussed in the left column and resulting inferences and predictions in the right column. KEY QUESTIONS: What factors in one's lifestyle and family history increase the odds of having good health now and in the future? Why? What factors increase health risks? Why? What decisions can students make now to alter their lifestyles and increase the odds of becoming healthier?

For a special report, have a student research various categories of medications or advances in modern pharmacology that benefit family health. Information can be obtained from reference materials and interviews with physicians or pharmacists. Have the student orally share the written report with the class.

Instruct students to research and write papers on the effects of environmental hazards on health. Content may include a comparison of today's environmental hazards to environmental hazards in the past and technological side effects that can cause health hazards. When reports are presented, lead a class discussion on how individuals can minimize the health risks of environmental hazards. KEY QUESTIONS: How does an increase in population generate increasing health problems? Why is waste disposal a critical health concern? What health risks are posed to the human body by air pollution? What are examples of specific pollutants that harm the respiratory and other body systems? Why is water pollution a health hazard? What causes water pollution? How is water pollution controlled and treated? What effects does noise pollution have on human beings? What health concerns are associated with nuclear energy? CRITICAL QUESTION: How can individuals minimize health risks posed by environmental hazards?

Mathematics
Science
Language Arts

Invite a pharmacist to speak to the class on purchasing and administering medication. Ask the speaker to discuss the importance of reading and following directions regarding dosage, timing, expiration date, and special instructions such as "Take with food or milk." Ask the pharmacist to demonstrate how to measure the correct dosage of several sample prescriptions. Reinforce the need for academic skills by having the guest summarize mathematics, science, and language arts skills required in the pharmaceutical profession. Have students take notes and write summaries of the points discussed.

Family Life

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the area of family life, refer to *Individual and Family Life*, which is available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Have students research and compare costs of different forms of entertainment and recreation and record the results in chart format. Lead a class discussion on the charted data. KEY QUESTIONS: What are the most economical forms of recreation and entertainment in the community? What is the cost of the entertainment your family enjoys? What is the hourly cost of the entertainment or form of recreation? (For example, a movie two hours in length may cost $3.50 while two games of bowling may cost the same but take only forty-five minutes to complete.) What additional costs are likely to be incurred when participating in each activity? (For example, what would be the cost of snacks, transportation, or equipment rental?) NOTE: Students may fail to recognize a need for mathematics skills in family life. Use activities such as this to illustrate how application of math concepts can benefit families, often with enjoyable results.

List and describe stages in the family life cycle. Stages are identified in Teaching Aid 9, The Family Life Cycle, in *Individual and Family Life*, available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas. Instruct each student to interview an elderly person to determine how many years he or she has spent in each stage of the family life cycle. Have students record the information, compute the percentage of time spent in each stage of the family life cycle, and draw circle graphs depicting the results. Display the graphs to illustrate similarities and differences in the duration of life cycle stages in different families. Point out to students how mathematics concepts related to graphs and percentages are used in this activity.

Science

Lead students to brainstorm to list examples of family problems and crises. Have one student record the examples. Divide the class into groups and have each group classify the examples into categories. Have the class work together to classify groups of potential family problems and crises on a visual aid to display in the classroom. Remind students that classification is a scientific tool used to organize data for better understanding and analysis.

Language Arts

Have students select time periods from the past about which they have studied. Instruct each student to pretend he or she is a member of a family during the chosen time period and write a fictional journal entry for one day, describing activities of family members from morning until night. Lead a class discussion on the compositions. KEY QUESTIONS: How have technological advances caused the roles and activities of family members to change? What changes do you consider most positive? What changes might be considered negative to family life? How might the typical evening activities of a family in the 1890s differ from those of a family in the 1990s?

Invite a language arts teacher to review colloquialism, slang, idiom, and jargon with the class. Lead students to brainstorm to list examples of these forms of language, especially slang, that are commonly used by students. Then, have students interview parents and elderly family members and ask them to provide examples of such expressions they have used and to define the expressions students listed in the brainstorming session. Lead a class discussion on students' findings. KEY QUESTIONS: What examples of colloquialism, slang, idiom, and jargon were obtained in the interviews? How do the meanings of expressions vary among differing age groups? How might communication misunderstandings result when using such expressions? CRITICAL QUESTION: How can misunderstandings caused by use of expressions with different meanings be avoided?

Collect newspaper clippings of "Dear Abby" letters pertaining to family issues and problems; have students assist in building the collection. Separate the reply portions from the letters and give each student a letter to read and analyze. Instruct students to compose logical responses to the letters and share the letters and responses with the class. Lead a class discussion on the issues described and assist students in developing other possible responses. Compare students' responses with the columnist's responses. Make students aware that they have exercised language arts skills during the activity.

Mathematics
Language Arts

Divide the class into small groups. Assign each group one form of family recreation or entertainment. Instruct each group to suggest ways to modify the recreational experience to lessen the cost and to expand the amount of time spent or pleasure gained by the family. Have each group record their suggestions and select one group member to present the information to the class. Ask each group to identify various mathematics processes employed by the group during the activity.

Science
Language Arts

Assign students to write papers discussing the impact of science and technology on family life. Library references, science teachers, and elderly persons who have witnessed scientific and technological advances may serve as resources. Have students follow the composing process. As students share their reports in class, compile a list of scientific and technological events discussed and display the list as a basis for further discussion.

Food Science and Nutrition

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the area of food science and nutrition, refer to *Food Science and Nutrition*; *Advanced Food Science and Nutrition*; *The New Nutrition*; and *Food Production, Management, and Services*. These books are available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Gather a wide assortment of measuring cups and spoons in metric and customary units. Divide the class into groups to compete in a game titled, "Can You Measure Up?" Prepare and ask questions requiring students to use and identify appropriate units of measure and award points to the groups for correct answers or demonstrations. Refer to Teaching Aid 2, Metric Units of Measure. Questions may be asked in the following areas:

- equivalencies – How many tablespoons equal 1/2 cup? How many milliliters equal one liter?
- common abbreviations – What do the abbreviations *t*, *T*, *ml*, and *c* represent?
- choosing appropriate measuring tools – Select the measuring tools you will need for the following recipe.
- techniques – How do cups for measuring dry and liquid ingredients differ? Why?
- demonstrations – Demonstrate the correct way to measure ingredients such as flour, shortening, liquid, and brown sugar.

Remind students that estimating solutions to problems is an essential mathematics skill. Instruct students to practice their estimation skills by completing the following activities:

- Prepare a poster listing menu selections and prices similar to the menu displayed in a multichoice cafeteria line. Give each student a varied amount of paper money to spend and have each quickly select a balanced meal from the listed items. Have one group of students use a calculator to total the prices of selected items to be sure each student can pay the cashier the total amount, including tax. Have another group analyze the nutritional value of the meals.
- Display a wide assortment of groceries tagged with prices. Give each student a specified amount of paper money and have each shop from the displayed groceries. Instruct students to purchase as many groceries as possible without exceeding the budgeted limit. Have a selected student use a calculator to compute the exact totals.

Lead a class discussion on why the ability to reasonably estimate such totals is helpful and can avoid embarrassment. KEY QUESTIONS: How accurate were cost estimates for meal and grocery totals? How can one become more accurate in making mental estimates? What type of practice can improve estimation ability? What are one's options when the total cost figured by the cashier exceeds the total amount of cash? In what other instances is the ability to mentally estimate important?

Assign groups of students to compute and compare the cost of preparing a favorite meal at home with the cost of purchasing the same meal in a restaurant, being sure to include tax and tip in the restaurant cost. One group might compute and compare the cost of homemade pizza with carry-out or delivered pizza, taking into consideration pizza coupons that may be used. Have groups share and discuss their findings with the class. KEY QUESTIONS: How do the costs of restaurant meals compare to the costs of the same meals prepared at home? What are advantages and disadvantages of both restaurant and home-prepared meals? How did the cost of homemade pizza compare to the cost of carry-out or delivered pizza? How did coupons affect the cost of the pizza? What factors affect decisions regarding meal alternatives? How might a family on a limited budget plan to include a variety of meal alternatives?

Science

Assign a student to research and report on the qualities and uses of baking soda. A chemistry teacher may serve as one resource. Lead a class discussion when the report is presented. Remind students that food science is built on science concepts, especially chemistry. KEY QUESTIONS: What is the chemical term for baking soda? What are household uses for sodium bicarbonate? What are medicinal uses? What household or medicinal products contain sodium bicarbonate?

Have students define the following terms:
- *microorganism*
- *bacteria*
- *fungi*
- *mold*
- *yeast*

Provide students with copies of Teaching Aid 9, Bacteria, Molds, and Yeast, and have them perform the suggested experiments. Remind students to follow steps in the scientific method and to accurately observe and record results. Lead a class discussion on the science principles illustrated. KEY QUESTIONS: What causes food changes related to microorganisms? What are examples of desirable and undesirable changes in food caused by microorganisms? What factors promote growth of microorganisms? How can growth of microorganisms be inhibited or eliminated?

Assign each student to look at food product labels at home and list the names of at least twelve food additives. Compile students' lists into one class list. Divide the list among students and instruct them to research the following:
- the major use of each additive in food
- the chemical composition of each additive
- possible toxic or nontoxic effects of each additive
- additional information about each additive

Have class members use the findings to compile a food additive chart.

Language Arts

Based on students' input, compose a class definition for the term *nutrition.* Then have one student consult a dictionary and compare the definition to that developed by the class. Also have a student use a dictionary to check the etymology of the words *nutrition* and *nutrient* to discover the meaning of the word base. Have students list other words derived from the same word base. KEY QUESTIONS: How does the class definition of *nutrition* compare to the dictionary or textbook definition? What is the stem of *nutrition*? From what language is the word derived? What is the meaning of the stem? What other words are derived from the same stem? CRITICAL QUESTION: How does researching the etymology, or study of a word's history, expand understanding of a word like *nutrition*?

Provide examples of food labels. Have students demonstrate the ability to read and interpret information on the labels by answering questions pertaining to the following:

- nutrient information
- calories
- serving size and number
- weight
- lists and functions of ingredients

KEY QUESTIONS: What is the standard form for listing nutrition information on food labels? Are calories given for total contents or per serving? How does information on serving size help in meal planning? Of what value is net content weight to the consumer? What is the significance of the order in which ingredients are listed? What additional information may be included on food labels?

Give students directions for preparing a complex recipe. Quiz students to evaluate their abilities to read and understand complex directions. Questions might relate to ingredients, sequence of steps, length of cooking time, and special instructions. KEY QUESTIONS: What are the recipe ingredients? What is the correct sequence of steps? How might altering the sequence affect the recipe outcome? What instructions are given regarding the cooking time and temperature? What special instructions are included in the recipe? CRITICAL QUESTION: Why is the ability to follow written directions the key to successful preparation of a recipe?

Mathematics
Science

Have each student keep a record of all food eaten during a three-day period. Have students refer to current nutritional tables, found in the back of most food science and nutrition textbooks, and compute and analyze the nutritional value of their diets. Have students compare their analyses to the U. S. Recommended Daily Allowances (RDA) of nutrients for persons in their age group. Point out to students that this activity employs several fundamental skills of math and science. KEY QUESTIONS: How do the diet analyses compare with recommended amounts of each nutrient? Looking at the class as a whole, how nutritious are students' diets? Why do U. S. RDA percentages vary by age level? CRITICAL QUESTION: If specific nutrients are lacking, what foods can be included to fulfill the requirement for those nutrients?

Ask students to use resources to determine their own recommended calorie requirements per day. Have each student develop a personal three-day food plan that meets the recommended calorie requirements and also fulfills suggested Recommended Daily Allowance and food group requirements. Have small groups of students constructively evaluate one another's plans, check calorie computations, and make suggestions for improvements. Allow students to use calculators throughout this activity.

Mathematics
Language Arts

Write names of food products on index cards. Divide the class into groups and ask each group to draw a card. Have each group tour a grocery store and chart prices of the food item in various sizes and brands, comparing unit cost differences between name brands and generic brands and small and large quantities. Lead a class discussion on the charted findings. KEY QUESTIONS: How did prices of name brands compare with generic or private label brands? Are larger quantities always the best value? Why? What factors determine the brand and quantity of foods purchased?

Science
Language Arts

Assign each student to write a descriptive essay explaining in his or her own words a selected food science phenomenon. Examples of food science phenomena include the following:
- how yeast causes bread to rise
- what causes food to spoil
- how forms of fat differ
- what keeps mayonnaise from separating

After students share their essays orally, lead a class discussion on key principles of science represented. KEY QUESTIONS: What is the relationship between yeast, carbon dioxide, and the process of leavening dough? What conditions inhibit food spoilage? How does the chemical makeup of saturated, monounsaturated, and polyunsaturated fats differ? What is an *emulsion*? How do eggs act as an emulsifier in mayonnaise?

Divide the class into groups to research the topic "Baking is a Science." Have the groups consult science reference books, science textbooks, or chemistry or other science teachers to analyze the physical and chemical reactions and changes that occur during the baking of bread. Have students share their reports with the class, using posters or examples of baked products at various stages.

As a cooperative learning experience, instruct groups of students to complete one or more of the experiments described on Teaching Aid 10, Chemical and Physical Properties of Food. Have each group record the results of their experiment and generalize the principles of food preparation and storage demonstrated. KEY QUESTIONS: How do proper storage methods inhibit conditions that contribute to food spoilage? What kinds of food storage are available? What physical and chemical changes occur when foods are not properly stored? How do preparation methods affect chemical and physical properties of food? What factors affect choice of proper preparation methods? CRITICAL QUESTION: What generalizations regarding food preparation and storage can be drawn from these experiments?

Housing

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the area of housing, refer to *Housing, Design, and Furnishings*; *Interior Design*; *Hospitality Services*; and *Housing, Home Furnishings, and Equipment Management, Production, and Services*. These books are available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Ask a real estate agent to provide examples of selling prices of homes in three differently priced neighborhoods and list reasons for price differences. Divide the class into three groups and assign each group a different neighborhood. Have each group compute the mean and median prices of homes in their assigned neighborhood. If necessary, review the definitions of mean and median on page 29. Lead a class discussion comparing average prices of homes, analyzing reasons for price differences, and discussing factors to consider when choosing a housing location. KEY QUESTIONS: What are the mean and median prices of homes in each neighborhood? How does the cost per square foot of floor space vary in the neighborhoods? What reasons might explain price differences? What factors should a family consider when choosing a housing location? How does the family life cycle affect housing needs?

Arrange for a carpenter to demonstrate measurement tools and measuring techniques used in the building trade and to explain why skill in measuring accurately is critical. Evaluate students' accuracy as they practice using the tools to measure specified objects. KEY QUESTIONS: What measurement tools are used in the carpentry trade? What are proper techniques for using each tool? Why are accurate measurements critical? What consequences can result from inaccurate measurements of such construction details as cabinets, windows, and door frames?

Provide students with scale drawings of an apartment floor plan. Point out to students that mathematics skills are essential in many areas of housing. Provide calculators to students and instruct them to apply mathematics skills by computing answers to the following furnishing and decorating problems:
- Calculate the wall and ceiling area of a specified room. Given the cost per gallon of paint and estimating that one gallon of paint will cover 400 square feet, figure the cost of paint for the room.
- Calculate the square yardage of floor space. Given the cost per yard of installed carpet, figure the cost of carpeting the apartment.
- Compute and compare the costs of alternate floor coverings and determine which is most economical.
- Given a newspaper advertisement or catalog of home furnishings, list desired apartment furnishings and total the cost.

Science

Have students develop and perform experiments testing the cleanability of selected upholstery fabric samples. Students should follow the steps of the scientific method. Provide fabric samples varying in component materials and cost; include treated and nontreated fabrics. Lead a class discussion on the results of the experiments. KEY QUESTIONS: How does fabric cost relate to cleanability? What fabrics clean most easily? Why? Do nonstain treatments work? Why? Why is it important to consider cleanability in selecting upholstery fabric?

As an enrichment experience, have one student contrast soap and detergent; define *cationic*, *anionic*, and *nonionic*; and demonstrate each of these cleaning agents to the class. Point out to students that this activity is based on science concepts. An excellent source of information is the *Institutional Maintenance Reference Book*, available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Invite a life science teacher to present a lecture on structures, processes, and economic importance of plants. Have students take notes, summarize the lecture as a class, and relate the information to the floral industry and the care of live plants. KEY QUESTIONS: What structures and processes do plants have in common? How do structures and processes vary among plants? In what ways do plants and plant products contribute to the national economy? What is the economic importance of the floricultural industry? From information presented in the lecture, what generalizations regarding plant care can be inferred?

Language Arts

From a mortgage company, obtain amortization printouts on homes in three price ranges, based on both fifteen-year and thirty-year mortgage payouts. Guide students to employ language arts skills in reading and interpreting the printouts. KEY QUESTIONS: What is the initial mortgage amount, interest rate, number of years, and monthly payment total given? In a given month and year, how is the payment proportioned between principal and interest? How does the proportion of principal to interest change from the first, fifth, tenth, and last year? What is the total amount of interest paid the first, fifth, tenth, and last year? What would be the effect of making extra principal payments during the first five years? What is the difference in monthly payments of a fifteen-year and a thirty-year mortgage loan? When would each be most feasible?

Science
Language Arts

Ask a student to locate current population trend graphs and figures to share with the class. Instruct students to investigate and write reports inferring how population trends affect housing. Make students aware that they are using academic skills to read and interpret graphs and figures, make inferences, and perceive cause and effect relationships. KEY QUESTIONS: How do population trends regarding age distribution relate to housing trends? How might increased numbers of older Americans affect housing trends? What effects might an increasing total population have on housing? What housing consequences might result from population shifts from rural to urban areas?

Arrange for a science teacher to discuss types of energy used to fuel the home, such as heat (thermal), mechanical, electrical, electrochemical, and nuclear. Energy sources and resources, comparison of energy types, costs of energy sources, conservation of energy, and technological advances related to energy may be discussed during the lesson. Instruct students to take notes and organize them in outline form after the lesson.

Management

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the area of management, refer to *Management*, which is available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Assemble samples of utility bills, including gas, electric, and water bills. Give groups of students sets of bills with instructions to respond to the following questions:

- What unit is used to measure usage of each utility? (For example, gas is measured in cubic feet, electricity in kilowatt hours, and water in gallons or cubic feet.)
- What is the current unit cost of gas, water, and electricity in the community?

Demonstrate step by step how utility charges were calculated on each bill. Point out math operations used in the calculations and review customary and metric measurements using Teaching Aid 2, Metric Units of Measure, as required.

Have students contact an electric company or consult references to find *wattage ratings* (watts used per hour) of commonly used appliances such as the following:

- refrigerators
- microwaves
- stereos
- televisions
- dishwashers
- toasters

Make a chart with the following headings: appliance, wattage rating, hourly operation cost. After listing appliances and filling in wattage ratings, have students use the following formula to compute hourly operation cost of each appliance: wattage rating/1000 x cost per kw hour = hourly operation cost. NOTE: Remind students that 1000 watts = 1 kilowatt. KEY QUESTIONS: What appliances consume the most electricity, thus having higher operation costs? What three appliances appear to add the most cost to a family's monthly electric utility bill? What practices can reduce the total amount of electricity used in a household? What alternatives might be substituted for use of some of the appliances?

Invite an economist to speak to the class on current economic trends and suggest recommendations for family financial decision making based on current trends. Work with the speaker in advance to develop a work sheet giving students practice in computations involving interest rates, inflation rates, and other topics related to the presentation. KEY QUESTIONS: In general, what happens to employment, interest rates, and prices during a period of inflation? How do these changes affect family financial decision making? What happens to employment, interest rates, and prices during a recession? How do changes resulting from recession affect family financial decision making? How might a family adjust their saving and spending practices during periods of inflation and recession?

Science

Divide the class into groups to read references and interview science teachers about ecosystems. Instruct each group to prepare a written paper defining *ecosystem*, giving examples of ecosystems and explaining how management practices can preserve ecosystems. KEY QUESTIONS: What are examples of ecosystems? How do organisms in each of these ecosystems interact with each other and with the nonliving environment? What materials are necessary to maintain life in an ecosystem? What changes within the ecosystem may cause these materials to be depleted or polluted? What consequences result? CRITICAL QUESTION: What management practices can individuals promote to preserve ecosystems?

Have students research community recycling and waste management resources and facilities. Lead a class discussion on the findings. Point out to students that concepts related to ecology and the environment are central to both life science and earth science. KEY QUESTIONS: How does recycling help preserve the earth's ecosystem? How does recycling help conserve earth's limited resources? Why is waste management necessary? How does population growth affect space for waste disposal? What methods are used to collect and dispose of waste? Where is waste taken for disposal? Does the community have a landfill? What new technologies exist for waste disposal? How does waste disposal affect the present and future environment? How costly is waste disposal to the individual and the community?

As a class project, have students investigate computer applications that facilitate management and decision making. Students may interview parents or friends, persons in business, or computer teachers who use such programs. Compile, discuss, and display printouts from the programs. Arrange for a school or business computer specialist to demonstrate management software. Note that advances in science and technology provide powerful management tools. KEY QUESTIONS: What management computer software is available? How do the types of software compare? Which software appears to be most useful? Would using the computer applications simplify the management process? Why?

Language Arts

Assign students to read short stories or selected portions of novels and identify decisions that led to cause and effect relationships. Lead a class discussion analyzing decision-making techniques used. Lead students to brainstorm other decisions that might have been made and predict how different decisions might have affected the outcome. Remind students that ability to perceive cause and effect relationships is an essential language arts skill.

On slips of paper write down various decision-making scenarios such as the following:
- purchasing a major appliance
- selecting a form of life insurance
- deciding to have a child
- buying a new car

Have each student choose one slip of paper and develop a written bibliography of sources providing information that could assist in making a responsible decision. Encourage students to visit the library when searching for sources. Share the bibliographies with the class. Remind students that knowing how and where to locate information when it is needed is a powerful decision-making tool, especially in a society where information constantly expands and changes.

Display definitions of *lifestyle, standard of living,* and *level of living.* Ask students to record examples of various lifestyles and standards and levels of living exemplified by families on television programs for a period of one week. At the end of the week, lead a class discussion on students' findings and have students develop a chart depicting the examples noted. KEY QUESTIONS: What differing lifestyles were observed during this activity? How did levels and standards of living exhibited by the television families differ? How are lifestyles, levels, and standards of living interrelated? With which television family can each student most identify? Why?

Science
Language Arts

As an FHA/HERO project, have students plan and implement a school recycling program to collect aluminum cans, paper, cardboard, and other selected recyclable materials. Have students locate centers that collect recyclable materials, set up collection points in the school, publicize the project, and deliver the materials for recycling. In publicizing the project, students should compose a persuasive article relating recycling to conservation and environmental responsibility.

Have each student write a letter to the editor persuading readers to conserve a selected resource. The letter should include reasons and suggested methods for conservation. Have students share their letters with the class and allow the class to select letters to submit to a school newsletter or local newspaper. Make students aware that both science concepts and language arts skills are reinforced in this activity.

Divide the class into groups representing differing viewpoints on the following topic: A Nuclear Power Plant Located Next Door. Have the groups debate whether the community should support or oppose the building of a nuclear power facility. Encourage students to think critically about the issue, looking objectively and factually at all viewpoints. KEY QUESTIONS: Why is it necessary to develop new sources of energy? What benefits does nuclear energy offer society? What risks are involved? What economic advantages might a nuclear power plant offer the community where it is located? What disadvantages might the community face?

Managing Work and Family

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the area of managing work and family, refer to *Single Parents: Managing the Dual Role of Homemaker and Wage Earner* and *Home and Career*. Also, modules teaching skills for balancing work and family are available in *Skills for Life*. These materials are available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Have students survey parents and friends regarding the cost of full-time child care for one child for one week. Compile the findings in a chart and have students compute the mean and median cost of child care. Based on the mean, ask students to figure the monthly and yearly cost of child care per child. Encourage students to use calculators in completing computations. Point out that students are using basic math operations, measures of central tendency, and charting skills.

Have each student list all of the tasks performed by members of his or her family for one week and complete a chart with the following headings: task, person who performs task, estimated hours spent per week. Instruct students to compute the total time individual family members spend completing tasks. Have small groups of students discuss the various ways responsibilities are divided within families. KEY QUESTIONS: How does division of responsibilities among family members vary in different families? What factors affect the amount of responsibility assigned to a specific family member? What effect does outside employment have on tasks performed by various family members? Does the distribution of tasks within families appear fair to all family members? Why? What changes in task distribution might benefit the function of the family?

Science

Invite a life science teacher to share with the class unique examples of male/female role variances in the animal kingdom, such as instances where the male cares for the unborn or young or where the female has an unusually aggressive role. As a follow-up, lead a class discussion on what the class views as traditional male and female roles and discuss how and why those roles have changed during the past two generations. KEY QUESTIONS: What are examples of traditional male roles? What are examples of traditional female roles? How have those roles changed during the past several years? How do shifting roles within the family impact management of work and family?

Lead students to brainstorm to list scientific and technological inventions that make it easier for a person to perform multiple roles. To generate ideas, tell students to imagine a day in the lives of their grandparents as young adults and think of the time it took them to perform routine activities at home and work as compared to young adults today. KEY QUESTIONS: How would tasks performed by grandparents as young adults differ from tasks performed today? In what ways would routine home tasks such as food preparation, laundry, and cleaning have varied? What inventions enable persons today to spend less time and energy performing home tasks? What inventions save time and energy in today's workplace? CRITICAL QUESTION: How does technology affect resources for balancing work and family?

Language Arts

Have each student write a short biographical sketch of a personally admired individual who leads a full life and seems successfully to manage work and family roles. While obtaining biographical information, students should ask their subjects to list techniques that have helped them manage roles. Have students share their biographical sketches with the class. Instruct the class to compile and edit suggestions and develop a class list of techniques for balancing work and family roles. Make students aware that they are employing language arts skills in writing sketches and compiling and editing the list of techniques.

Write the following family life cycle situations on separate index cards:
- two parents starting a family
- single parent starting a family
- two-parent family with two teenagers
- single-parent family with two teenagers
- two-parent family with adult children
- single-parent family with adult children

Have each student draw one of the index cards and write an essay analyzing the challenges of balancing work and family that accompany the situation and suggesting ways to meet the challenges. Encourage students to use the composing process in writing essays and have students constructively critique one another's essays using Teaching Aid 7, Writing Checklist.

Mathematics
Language Arts

Give groups of students copies of statistics on women in the work force. Instruct students to interpret the statistics and discuss the inferred impact on women, the family, and society. Have each group summarize in writing their interpretation of the statistics and inferences regarding impacts.

Textiles and Apparel

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the area of textiles and apparel, refer to *Apparel*; *Textiles and Apparel Design*; and *Apparel and Textiles Production, Management, and Services*. These books are available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Design a visual aid depicting apparel typical of a student's wardrobe. Lead the class in assigning realistic prices to the apparel articles. Write varying dollar amounts on index cards and have each student draw a card; the amount chosen represents the student's assigned apparel budget. Have each student select apparel items shown on the visual aid, listing and totaling the purchases and including sales tax. Allow students to use calculators and point out math skills being utilized. The totals should not exceed the budgeted amounts. Lead a class discussion following the exercise. KEY QUESTIONS: What factors affected apparel choices? Did items selected enhance existing wardrobes? How? Will additional items, such as shoes or accessories, need to be purchased before the selected apparel can be worn? How can small apparel budgets be extended?

Use the back of a pattern envelope to review reading of charts and computing with fractions. Ask questions requiring students to figure amounts of fabric required and differences in amounts when view, size, or fabric width vary. Provide unit costs of fabric and required notions and have students use calculators to compute the total cost of constructing a garment, including applicable sales tax. KEY QUESTIONS: What information is necessary to determine the amount of fabric required by the pattern? What is the total fabric amount required for a given view, size, and fabric width? Based on this figure, what is the total cost if the fabric is $3.95 per yard? What is the cost if the fabric is $6.45 per yard? (NOTE: Allow students to practice computations by varying the view, size, fabric width, and cost variables.)

Display measuring tools used in apparel design, construction, and alteration. Have students take turns identifying the purpose of each tool and demonstrating how to accurately measure with each. Provide assistance and additional information as needed. Remind students that the ability to take accurate measurements is a mathematics skill essential to many occupational areas.

Science

Divide the class into three groups to investigate scientific inventions and technological advances related to apparel production. Instruct each group to focus on one of the following time periods:
- through 1799
- from 1800 through 1899
- from 1900 to the present

Have each group present their information to the class, supplementing the presentation with creative visual aids. Emphasize the importance of science and technology in the advancement of the textiles and apparel industry.

On audio tape, have a physical science teacher explain color as a phenomenon of light waves, a life science teacher explain color as a sensation perceived by the retina of the human eye, and a home economics teacher discuss color as an element of design. After students listen to the tape, orally quiz them to review points covered. Point out that many concepts, like color, have multiple aspects, with varying aspects emphasized in different disciplines. KEY QUESTIONS: How do the definitions of *color* vary? What do the definitions have in common? What new color concepts were learned from the scientific explanations?

Provide groups of students with fabric swatches of various types, including fabrics made of cotton, wool, silk, and manufactured fibers. Have each group investigate the effects of mildew on various fabric types by performing the following experiments:

- Dampen a set of swatches, seal in a plastic bag, and store in a dark place.
- Dampen a set of swatches, seal in a plastic bag, and store in a light place.
- Seal an undampened set of swatches in a plastic bag and store in a dark place.
- Seal an undampened set of swatches in a plastic bag and store in a light place.
- Store one set of swatches in a paper bag.

Have students record observations daily for one week, describing the size, number, and odor of mildew spots that develop. Instruct students to apply the scientific method in writing a summary of their group's activities and conclusions. Have students refer to Teaching Aid 5, The Scientific Method. At the end of the week, lead a class discussion on the findings and implications. KEY QUESTIONS: What types of fabric showed the most mildew? What conditions were most conducive to mildew? What can be inferred from the results about care and storage of textiles and apparel? What may happen if wet clothes are left in a washing machine or damp towels are left in a clothes hamper for several days? What storage procedures should be followed when storing items such as old cotton quilts and old baby clothes for several years?

Language Arts

Have each student select a garment to wear in a fashion show, accessorize the garment, and write a commentary describing the accessorized garment. Encourage students to make the commentaries as appealing as possible, using creative descriptions that will sell the outfits. Guide students in editing, revising, and compiling the descriptions into a class commentary and in presenting the fashion show. Point out how students are applying language arts skills while composing the commentary for a specific purpose and audience and how oral communication skills are used in the presentation.

Coordinate a joint project between an apparel class and a language arts class. Have apparel students secure illustrations of apparel designs from various historic periods in England, France, and the United States. Instruct language arts students to research literary contributions in each country during corresponding time periods. Have students work together to compose a time line displaying the apparel designs and literature selections. NOTE: To further expand the activity, ask a history teacher to speak to both classes, highlighting important events that occurred during the displayed time periods.

Instruct students to write reports on textile and apparel design in a developed or developing country, considering resources that contribute to the apparel industry in that country and the relative cost of goods produced there. Remind students to use the composing process in writing the reports. Have students refer to Teaching Aid 6, The Composing Process. Have students share their reports orally. Lead a class discussion on the apparel and design industry from a global standpoint. KEY QUESTIONS: How do costs of textile and apparel goods from the various developed and developing countries vary? What factors account for cost differences? How do wage scales affect production costs of apparel products? Why have the number of textile and apparel products imported into the United States increased in recent years? What effects does this increase have on United States consumers and on the economy?

The World of Work

NOTE: For additional learning experiences and teaching aids that reinforce mathematics, science, and language arts skills in the world of work, refer to *Employability* and *Home Economics Career Cluster*, available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

Mathematics

Guide students in computing discounts and markups using calculators as a tool. Assist students as needed and check accuracy of answers. Examples of problems are as follows:

- discounts – A store owner purchases items at market at a twenty-five percent trade discount. What is the discounted price on thirty items list priced at $49.00 each and on seventy-five items list priced at $117.50 each? An additional cash discount of five percent is available at market. If the owner pays cash for the above items, what are the discounted prices?
- markups – If the owner decides to mark up the items purchased at market by thirty-three percent, what is the markup? What are the selling prices of the items?

Write the following equation on the chalkboard: gross salary - payroll deductions = net salary. Have students define *gross salary* and *net salary* and list examples of payroll deductions. Provide students with examples of paychecks and stubs such as shown on Teaching Aid 11, Paychecks and Stubs. Have students explain each payroll deduction listed on the stubs. Provide additional mathematics practice by asking questions such as the following:

- What is the difference in the amount of gross salary and net salary?
- What percentage of the gross salary was withheld for federal income tax?
- What percentage of the gross salary was withheld for social security?
- If this check represents two weeks' pay, what are projected annual net earnings?

Invite a business teacher or financial analyst to discuss the importance of being able to analyze various types of figures and reports in many occupations today. Ask the guest to share copies of computerized reports used by businesses to analyze sales, profit, margin, expenses, production, and market share. Have teams of students practice interpreting the information on each report. Point out to students that advanced computer technology has brought complex information from high management levels to levels of employees involved in day-to-day operations. Encourage students to master skills in reading charts, tables, and graphic information. If review is needed in some areas, arrange for a mathematics teacher to work with individuals or groups of students.

Science

Lead students to brainstorm to identify scientific and technological inventions that are essential to the operation of a business but that pose safety hazards when used incorrectly. Examples include the following:

- gas
- electricity
- chemical cleaners

- pesticides
- equipment
- machines
- flammable substances
- vehicles

Refine the list by combining similar items. Write the names of the items on index cards and have each student draw a card and list safety suggestions to follow when using the item.

Invite a fire department representative to speak to the class on fire prevention and extinguishing. Ask the speaker to explain why different types of fire extinguishers are used on different types of fires. Have students ask questions and develop a chart showing the most common types of fires and methods for extinguishing each. KEY QUESTIONS: What different types of fires may occur? Into what three categories are fires classified? What is a fire extinguisher? Why are different types of fire extinguishers required to extinguish various types of fires? What consequences might result from use of the wrong type of fire extinguisher? What safety procedures should be followed when extinguishing a fire? How does knowledge of science concepts relate to safety knowledge?

Have groups of students suggest ways employees can practice conservation in the workplace. Examples include product recycling and practices that save energy, water, and other resources. Lead a class discussion on students' suggestions and the results of implementing the ideas. Relate conservation ideas to science principles associated with environmental balance, resource depletion, and conservation. KEY QUESTIONS: Why are conservation practices important to individuals and to businesses? What is the financial impact of such practices? How do conservation practices affect the quality of life? If an employer has to spend excess dollars on energy costs, how might employees be affected? How can the suggestions listed be implemented currently in the school or in students' homes?

Language Arts

Lead students to brainstorm to list careers related to home economics. Have each student select one of the careers listed and compose a classified advertisement describing a job opening for a related position. Guide students in locating information they may need to compose the advertisements and provide examples of several classified advertisement sections from newspapers. Lead a class discussion on the resulting compositions. KEY QUESTIONS: What resources can provide additional information on a specific career? Where is the classified advertisement section located in a newspaper? What information is typically given in a classified employment listing? Are classified advertisements a useful tool in searching for employment? Why? What other resources are useful in seeking a job?

Have students research sources for locating career leads and information. Students may visit the library and question resource persons such as teachers, school counselors, and personnel agents. Guide students in compiling the identified sources and designing a brochure titled, "Career Bibliography." Print the brochure and share it with students in vocational classes, FHA/HERO members, and school counselors.

Lead students to brainstorm to list reasons why reading and writing skills are essential in the job search process. Provide examples of job application forms, résumés, letters of application, and interview follow-up letters for students to examine and critique. Then have students practice filling out blank forms and writing sample letters and résumés. Remind students to follow the steps in the composing process as shown on Teaching Aid 6, The Composing Process. Evaluate the products for neatness, effectiveness of language, and mechanical correctness.

Mathematics
Language Arts

Invite a banker to overview financial reports, such as income statements and balance sheets, that are critical to operating a business and obtaining financing. Have students develop a list of basic financial terms mentioned by the speaker and follow-up by listing and defining terms such as the following:

- *assets*
- *liabilities*
- *gross sales*
- *inventory*
- *cost of goods sold*
- *net income*
- *equity*

Point out to students that reading and interpreting financial reports requires mathematics and language arts skills. KEY QUESTIONS: What are examples of assets and liabilities? How is the equity or worth of a company computed when total assets and liabilities are known? How do gross sales differ from net sales? What is cost of goods sold? How is it computed? Why is careful inventory tracking important to financial record keeping? What is net income or net profit? How is it determined?

Mathematics
Science
Language Arts

Gather three large sheets of paper and place one of the following titles on each sheet:

- Mathematics Applications in the World of Work
- Science Applications in the World of Work
- Language Arts Applications in the World of Work

Lead students to brainstorm to list skills that a business person might need in each academic area and list each skill on the appropriate sheet. When complete, invite mathematics, science, and language arts teachers to review the respective lists and make suggestions for additional skills needed. Display the sheets as a reminder that academic skills are essential to successful employability.

List business career opportunities related to home economics as outlined in Units II through VI of *Home Economics Career Cluster*, available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas. Have students work in groups and instruct each group to develop a table with the following headings:

- career choice

- home economics area of specialization
- mathematics skills
- science skills
- language arts skills

For each career opportunity listed, have students record the home economics related area of specialization and special mathematics skills, science skills, and language arts skills required to perform the job. For example, if the career choice is baker, the area of specialization is food science and nutrition. Mathematics skills include computing food quantities; accurately measuring time, weights, and amounts; and using estimation skills. Science skills include knowledge of chemical and physical reactions that occur during baking, manipulative skills, and safety skills relating to heat, energy, and fire extinguishing. Language arts skills include reading, composing or adapting recipes, requisitioning supplies, and listening to instructions or customer requests. References charting academic skills required for specific occupations are available in libraries.

Teaching and Evaluation Strategies

Approaches to Vocational/Academic Integration

The movement to integrate vocational and academic education is multidimensional. There are many proponents of vocational/academic integration, including employers, educators, and legislators. Direction and funding for integration thus come from multiple sources, which gives rise to a variety of goals and methods.

Various models have emerged for integrating vocational and academic education. One approach is to integrate academic principles in existing vocational courses, reinforcing academic skills while teaching vocational content. *Integration of Mathematics, Science, and Language Arts Principles in the Home Economics Curriculum* is designed to facilitate this approach. Another approach is to increase the vocational focus of academic curricula, making content more relevant to students' current environment and employability. Applied academic courses exemplify this approach. These two integrative approaches are the most common because they build on the framework of existing courses and can be implemented most quickly with the fewest course changes.

Other integrative models emerging more frequently fuse vocational and academic content to develop new content areas, blending subject matter around thematic or occupational clusters. Academies, magnet schools, and single-occupation high schools are designed to provide academic training within a specific occupational area.

Each of these models provides new opportunities and challenges for teachers, administrators, and students. Teachers are challenged to plan and implement integrative strategies, obtaining additional training as necessary. Administrators must support integrative efforts by providing teachers with time, tools, and training, as well as a means of recognizing and rewarding cooperative efforts. Students stand to gain the most from vocational/academic integration, as academic competence and employability skills are both strengthened.

Collaboration between Vocational and Academic Teachers

For any form of integration to succeed, cooperation and collaboration between vocational and academic teachers is essential. As home economics teachers integrate mathematics, science, and language arts principles in the home economics curriculum, academic teachers can serve as excellent resources for strengthening students' academic competencies.

Collaboration can occur during planning, teaching, remediation, or any combination of stages. Teachers might review one another's lesson plans, offering suggestions for blending academic content with vocational content and vice versa. An academic teacher might assist in teaching a vocational class lesson heavily loaded with academic content, or a vocational teacher might share life skills and employability content with an academic class. Laboratory facilities and equipment might be shared by classes.

A positive result of collaborative efforts is that as students observe vocational and academic teachers actively working together, exhibiting mutual respect for one another's content disciplines, they realize that both are important and relevant to their educations. Seeing teachers collaborate helps students understand that content areas are not isolated subjects but integral parts of a total education preparing them for various aspects of life, including work, family, and personal activities.

Cooperative Learning

The need for collaboration and cooperation is not unique to education. Many problems encountered in society and in the workplace are becoming too complex to be solved single-handedly by individuals. Cooperative efforts are necessitated, with individuals bringing specialized talents and knowledge together in a group problem-solving effort. The ability to work in such a group is essential to students' future success.

Cooperative learning experiences in the classroom not only impart immediate knowledge through student-centered activities but also foster social skills essential to working in diverse groups throughout a lifetime. In cooperative learning experiences, students must cooperate with one another to accomplish assigned tasks, making organizational decisions, establishing objectives, monitoring progress, and sharing responsibility for the outcome. In addition, they must learn effective ways to support, motivate, and praise one another in order to maximize teamwork and maintain a positive group attitude. Individual and corporate responsibility are thus fostered, both of which are essential in the world of work and in society.

Cooperative learning is a useful strategy for reinforcing mathematics, science, and language arts principles in the home economics classroom. Heterogeneous grouping of students by academic ability allows students with high levels of academic skills to share academic concepts with other students in the group and to assist in peer instruction and evaluation. One student, for example, might serve as the mathematics, science, or language arts specialist for the group; that student uses higher order thinking in the process of explaining to peers, while lower achievers in that academic area benefit from peer tutoring within the group.

Higher Order Thinking Skills

The desired result of successful integration of vocational and academic education is a preparation of students for meaningful and productive roles in an increasingly complex society. While knowing and comprehending factual information is basic to learning, higher levels of thinking are also necessary. Knowledge becomes beneficial when it is applied to situations involving decision making and problem solving, when it is used to analyze issues, and when it is reorganized into an internalized framework for meeting the everyday challenges of an individual at work or home.

Higher order thinking encompasses many skills and processes, including creative thinking, critical thinking, decision making, problem solving, and metacognition. Both vocational and academic content must be taught in ways that encourage students to develop higher order thinking skills. Educational trends in mathematics, science, and language arts emphasize independent, student-centered learning, which encourage students to master processes and to apply information rather than merely accumulate large amounts of information. Depth of knowledge is emphasized over breadth.

> "Higher order thinking encompasses many skills and processes, including creative thinking, critical thinking, decision making, problem solving, and metacognition."

The home economics teacher is thus challenged to integrate mathematics, science, and language arts principles into home economics content, imparting knowledge through activities that promote higher order thinking and application to real-life situations. Higher order thinking can be incorporated as follows:

- Lesson plans should include objectives that require higher order skills; verbs that signal higher order skills include apply, use, analyze, infer, combine, classify, reorganize, evaluate, and substantiate.
- Learning experiences that foster higher order skills must be implemented. Solving problems using mathematics strategies, testing hypotheses through scientific experimentation, writing papers that reorganize and evaluate concepts, and verbally generalizing key concepts from reading assignments include both integration of academic principles and higher order thinking.
- Evaluation of higher order thinking requires students to do more than cite information and demonstrate basic comprehension. While testing for facts remains important, higher order skills can be evaluated using the same higher order thinking verbs used to write objectives. Students might write answers to essay and short answer questions, orally respond to higher order questions, classify a list of terms, or respond to open-ended choices.

Critical Thinking

Critical thinking falls under the category of higher order thinking, employing such skills as analysis, synthesis, and evaluation. Critical thinking is discussed separately in order to emphasize its importance to current educational theory and practice and because the ability to think critically is an important outcome of both vocational and academic education.

Critical thinking is an essential skill in today's highly technological, information-oriented society. Individuals are constantly bombarded with masses of information, often conflicting and often slanted. They must learn to distinguish relevant from irrelevant and factual from nonfactual information. Individuals must develop the ability to think rationally, independently, and objectively. At the same time, they must learn to recognize fallacies and propaganda techniques and to resist messages detrimental to individual and societal well-being.

Critical thinking is essential to competence in the areas of mathematics, science, and language arts. Reinforcement of each academic area provides additional opportunities, such as the following, simultaneously to reinforce critical thinking skills:

- In the discipline of science, critical thinking is central to science process skills (as discussed on page 39). As occurrences are explored scientifically, attitudes and skills central to critical thinking are strengthened. Teaching students to follow the scientific method of problem solving, basing conclusions on accurate and factual investigation, empowers them to think critically.
- Mathematics provide students with another tool for critical problem solving, as they are enabled to interpret numerical data independently, to question and judge the reasonableness of reported data, and to reason logically.
- Critical thinking skills are strongly emphasized in the discipline of language arts. Writing can be a powerful tool for developing cognitive thought processes. Writing forces students to organize and express thoughts. Thoughtfully structured writing tasks can require students to analyze and synthesize information, to form judgments and opinions, and to substantiate and defend their reasoning, thus practicing *metacognition*, which is thinking about one's own thinking process. Reading exercises provide exposure to new information; when supplemented by discussion or oral or written expositions, reading exercises require students to think critically about content.

Evaluation

Integration of academic principles in the home economics curriculum raises the questions of how and how extensively to evaluate principles of mathematics, science, and language arts. While home economics content remains the core of desired learning to meet specific course objectives, evaluation of reinforced academic principles is necessary to measure the effectiveness of integration efforts. As effectiveness is measured, strategies can be strengthened or adapted as required, and individual student needs can be addressed. Also, evaluation documents the teaching of academic principles in home economics classes.

Since integration brings separate vocational and academic components together into a whole, holistic evaluation of integrated content is a logical way to evaluate resulting products. In writing, for example, compositions have traditionally been evaluated analytically by the teacher. The teacher analyzes both overall content and mechanics of separate components. While empowering students to write is a goal shared by vocational and academic teachers, mastery of the mechanics of writing is not the focus of the home economics teacher. Holistic evaluation can therefore provide a quick, guided evaluation technique in which the teacher reads the written text as a whole and quickly assigns a rating. A checklist such as that shown in Teaching Aid 7, Writing Checklist, can be used to provide an objective criteria for evaluating the basic mechanics of writing when desired.

Self-evaluation and peer evaluation can serve as time-saving resources for teachers while providing cooperative learning experiences for students. In self-evaluation, the student learns to critique individual writing and to identify components needing improvement. Conferences with the teacher can enhance this process and provide direction for the student in revising written compositions. In peer evaluation, students critique one another's work individually or in groups. Essential elements of peer evaluation are discussion of constructive ways to suggest improvements and clearly defined criteria or a checklist for evaluation.

Holistic teacher evaluation and student self-evaluation and peer evaluation techniques can be similarly applied to measuring learning results from mathematics, science, and other language arts activities. Students might observe and rate peers conducting science laboratory investigations, check one another's mathematics computations, or constructively critique oral presentations. Creativity is essential in planning and implementing evaluation experiences, and collaboration with academic teachers in the evaluation process is encouraged.

Incorporating New Technology

There are multiple reasons for incorporating new technology in education. Technology is a learning tool that provides innovative, exciting new teaching strategies and can be useful in reducing drop-out and absenteeism rates. Since students will have access to technological tools for discovering and processing information throughout their lives, exposure to varied technology prepares students for future application. Many occupational opportunities exist in the field of information technology, and general employability is greatly dependent on the ability to use or interpret computer technology.

Integration of mathematics, science, and language arts principles in the home economics curriculum can be facilitated by electronic technology such as the following:

- computers – Educational software is available in all academic areas and for all levels of learners, including adaptive technology for physically disabled and learning disabled students. Computer tutorials can provide drill and practice for students deficient in specific academic areas, providing an excellent remedial resource. Telecommunications can link computers to other computers in the classroom or to computers in a distant location, allowing networked curriculum management or sharing of information with other users. Laptop computers can be taken outside the classroom for expanded use or into the home economics classroom for special projects.
- interactive media – Videotapes and videodiscs in the classroom allow students to interact with content and provide a framework for questioning and discussion, analysis and evaluation, and inference and critical thinking. A videodisc exploring subjects such as energy sources, the human body, or social interaction could build comprehension in ways not possible through oral or written text or still photographs. Resulting student interaction fosters higher order thinking.
- calculators – Calculators enable students with basic skills to perform advanced mathematical computations accurately. Balancing checkbooks, computing interest dollars, and multiplying or dividing fractions or integers can be done with calculators in the home economics classroom.
- other media (such as video cameras, audio tapes, and slides) – Having a variety of media available gives students varied opportunities to explore, create, and learn on a higher level.

Access to technological resources will obviously vary among school districts. Collaboration among vocational and academic teachers, library and computer specialists, and administrative planners is essential in order to plan and use available resources to enrich programs offered to students.

Adaptations for Special Needs of Students

Home economics teachers are well versed in identifying students with special needs, including handicapped, disadvantaged, and Limited English Proficient students, and in modifying instructional methods. Special needs strategies are reviewed on pages 17-28 of *Guide to Teaching* and pages 124-130 of *Home Economics Instruction*, available from the Home Economics Curriculum Center, Texas Tech University, Lubbock, Texas.

As efforts are intensified to integrate mathematics, science, and language arts principles into the home economics curriculum, additional challenges arise due to varying academic competencies of students within a class. Students with strong academic skills, who have taken advanced academic courses, will often be paired with students weak in some skills, who have taken no advanced courses. The teacher is challenged to raise academic levels of all students, without jeopardizing efforts to cover home economics essential elements.

The underachieving student needs additional time, attention, support, and encouragement, which should be provided when possible within the classroom context. However, the teacher is limited in the classroom by responsibilities to the class as a whole. Additional suggestions for assisting the student who underachieves in one or more academic areas are as follows.

- cooperative learning experiences – As discussed previously, students learn from peers in heterogeneous groups. Students with both high and low academic competency levels benefit from cooperative learning experiences.
- remedial programming – Additional time and encouragement often must be provided outside the programmed school schedule, either before or after school, on Saturday, or during the summer.
- teamwork among vocational and academic teachers and counselors – When teachers and school counselors work together, remedial instruction can be specifically tailored to meet students' needs and guide subsequent course tracking.
- tutorials – Computer-based instructional modules offer opportunities to build academic skills through drill and practice. A student can work independently at an individualized pace and achieve a sense of accomplishment as each step is mastered. Computer skills are also developed.
- peer tutoring – Students can benefit from tutoring by peers who have stronger skills in the areas needing improvement.
- parental involvement – Involving parents in the instructional process increases the chances of raising levels of academic competence among students and also strengthens the home economics program by making parents aware that academic concepts are being reinforced in vocational courses. Suggestions for involving parents include keeping parents informed about students' progress, using parents as resources for assignments, involving parents in decisions related to course selections, and engaging parents in remedial efforts. For example, a parent might help tutor a child or oversee completion of homework or tutoring assignments.

Current educational trends in mathematics, science, and language arts emphasize process skills; *learning by doing* and *learning to learn* are key phrases. As the student who underachieves academically practices these processes in mathematics, science, and language arts in meaningful applications in the home economics classroom, academic skills are used. Positive academic experiences build confidence, encouraging the student to further develop academic skills. As academic skills are better developed, students become better prepared for a lifetime of work and family responsibilities, thus fostering the objectives of home economics.

Teaching Aids

TA 1

Equivalencies between Fractions, Decimals, and Percents

Fraction	Percent rounded to tenths	Decimal rounded to thousandths
1/1	100.0%	1.0
1/2	50.0%	0.5
1/3	33.3%	0.333
2/3	66.7%	0.667
1/4	25.0%	0.25
3/4	75.0%	0.75
1/5	20.0%	0.20
2/5	40.0%	0.40
3/5	60.0%	0.60
4/5	80.0%	0.80
1/6	16.7%	0.167
5/6	83.3%	0.833
1/7	14.3%	0.143
2/7	28.6%	0.286
3/7	42.9%	0.429
4/7	57.1%	0.571
5/7	71.4%	0.714
6/7	85.7%	0.875
1/8	12.5%	0.125
3/8	37.5%	0.375

Fraction	Percent rounded to tenths	Decimal rounded to thousandths
5/8	62.5%	0.625
7/8	87.5%	0.875
1/9	11.1%	0.111
2/9	22.2%	0.222
4/9	44.4%	0.444
5/9	55.6%	0.556
7/9	77.8%	0.778
1/12	8.3%	0.083
5/12	41.7%	0.417
7/12	58.3%	0.583
11/12	91.7%	0.917
1/16	6.3%	0.063
3/16	18.8%	0.188
5/16	31.3%	0.313
7/16	43.8%	0.438
9/16	56.3%	0.563
11/16	68.8%	0.688
13/16	81.3%	0.813
15/16	93.8%	0.938

TA 2

METRIC units of measure

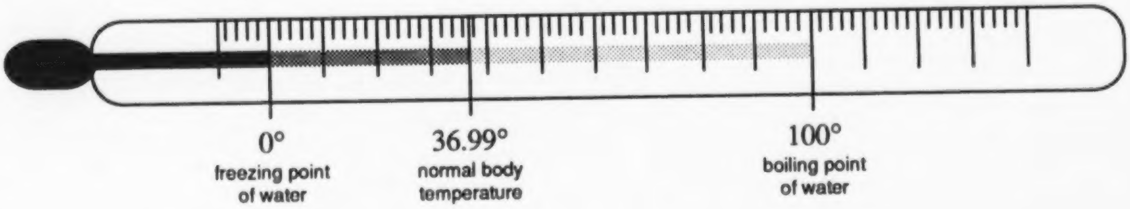
basic measurement units		
Measurement	**Basic Unit**	**Symbol**
Length	meter (or metre)	m
Volume	liter or cubic centimeter*	L or cm^3 or cc
Mass	gram	g
Temperature	degree Celcius	°C

*cc is the commonly used abbreviation for cubic centimeter in the health care profession

$1 L = 1000 cm^3$

$1 mL = 1 cm^3$

key metric temperature measurements



metric prefixes						
Equivalence	**Power of 10**	**Prefix**	**Symbol**	**Length**	**Volume**	**Mass**
1/1000	10^{-3}	milli	m	millimeter (mm)	milliliter (mL)	milligram (mg)
1/100	10^{-2}	centi	c	centimeter (cm)	centiliter (cL)	centigram (cg)
1/10	10^{-1}	deci	d	decimeter (dm)	deciliter (dL)	decigram (dg)
1	10^{0}	——	——	meter (m)	liter (L)	gram (g)
x10	10^{1}	deca or deka	dk	decameter (dkm)	decaliter (dkL)	decagram (dkg)
x100	10^{2}	hecto	h	hectometer (hm)	hectoliter (hL)	hectogram (hg)
x1000	10^{3}	kilo	k	kilometer (km)	kiloliter (kL)	kilogram (kg)

Outcomes & Probability

Determining the Number of Possible Outcomes

❶ List All Outcomes

Problem: How many outcomes are possible from tossing a coin?

Solution: heads or tails = two possible outcomes

Problem: A soup and salad bar offers three soup selections (tortilla, broccoli, and chicken) and two salad selections (tossed and avocado). How many combinations of soup and salad are possible?

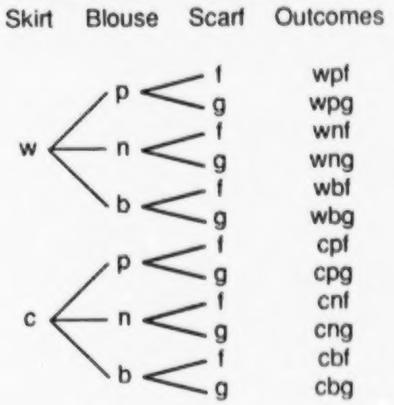
Solution: six possible outcomes

1) tortilla soup and tossed salad
2) tortilla soup and avocado salad
3) broccoli soup and tossed salad
4) broccoli soup and avocado salad
5) chicken soup and tossed salad
6) chicken soup and avocado salad

❷ Draw a Tree Diagram

Problem: Juanita has the following garments that she can combine to form different outfits:
two skirts – wool (w) and cotton (c)
three blouses – pink (p), navy (n), and beige (b)
two scarfs – floral (f) and geometric (g)
How many different combinations are possible?

Solution: twelve possible outcomes



❸ Multiply

Problem: Find the number of wardrobe combinations possible for Juanita through multiplication.

Solution: 2 skirts x 3 blouses x 2 scarfs = 12 possible outcomes

Probability

Probability is the likelihood of an event occurring.

$$\text{Probability} = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

- The probability of heads occurring in a coin toss is 1/2 or 1:2 or 0.50 or 50%.
- The probability of a person randomly selecting broccoli soup and tossed salad is 1/6 or 1:6 or 0.167 or 16.7%.
- The probability of Juanita randomly selecting to wear the wool skirt, pink blouse, and geometric scarf is 1/12 or 1:12 or 0.083 or 8.3%.

Frequency Tables, Charts, and Graphs

Twenty-five students scored as follows on a test:

41, 61, 68, 68, 70, 73, 76, 78, 79,
80, 81, 83, 83, 83, 84, 86, 88, 89,
89, 91, 93, 93, 96, 96, 99

The data is recorded in the table to the right.

Frequency Distribution Table
Test Scores

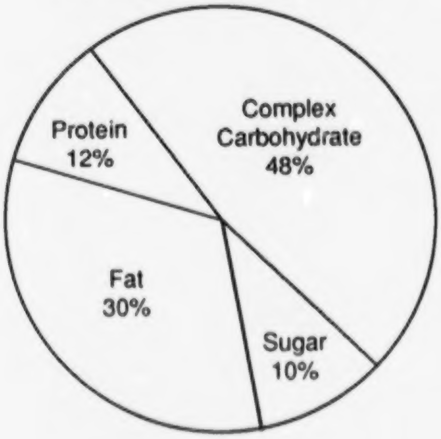
Test Score	Frequency (number of students)
<60	1
61-70	4
71-80	5
81-90	9
91-100	6

Table – Kathy's Diet

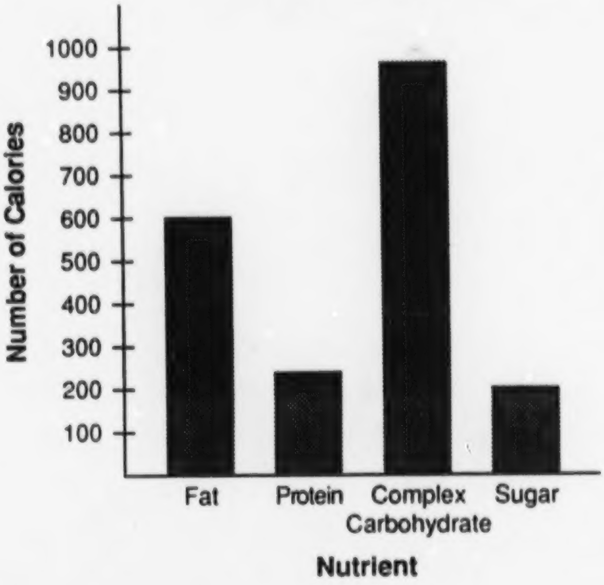
Nutrient	Number of Calories
Fat	600
Protein	240
Complex Carbohydrate	960
Sugar	200

Kathy kept a dietary record for one day and then computed the number of calories from each energy nutrient. The resulting data is recorded in the table to the left, the bar graph below, and the pie graph below left.

Pie Graph – Kathy's Diet



Bar Graph– Kathy's Diet



TA 5

The Scientific Method

1) ***Identify*** the problem and ***state*** it clearly as a question.

2) *Gather information* by such means as reading or observing.

3) *Form a hypothesis* or possible answer to the problem based on information gathered through research or observation.

4) *Test the hypothesis* through experiments or carefully recorded and classified observations.

5) *Draw conclusions* based on results.

The Composing Process

Prewrite and Plan

√Choose a topic.

√Define the purpose.

√Target an audience.

√Gather information.

√Organize information.

Write a First Draft

√Write to get topical ideas down on paper.

√Remember the purpose and audience.

√Do not concentrate yet on mechanics.

Revise

√Refine the content.

√Focus on organization of ideas.

Edit

√Proofread for mechanics and grammar.

√Evaluate organization,
topic development,
use of appropriate transition,
clarity of language, and
word and sentence variety.

Publish

√Share the product with an audience
in a variety of ways.

Writing Checklist

Date ______________ Writer ______________________ Evaluator(s) ______________________

Title of Composition ______________________ First Draft _____ Revision _____ Final Product _____

Area Evaluated	Rating*	Comments
Topic Is the topic interesting? Is the topic thoroughly researched? Is the topic developed well? Are sufficient sources used?		
Content Are ideas organized well? Does the composition exhibit unity? Is language clear? Are a variety of word and sentence structures used?		
Purpose Is the purpose clear? Does the writing accomplish the purpose? Do language choices convey tone and mood?		
Audience Is language and form suited to intended audience? Will the composition hold the attention of the audience?		
Mechanics Is correct punctuation used? Is spelling correct? Are parts of speech used correctly?		
Form Are paragraphs indented properly? Are margins appropriate? Is writing legible?		

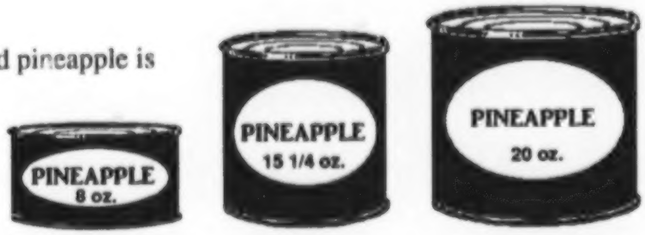
*Rating Scale 5-1: 5 – excellent; no revision suggested 3 – satisfactory; revisions could improve 1 – still needs major revisions

TA 8a

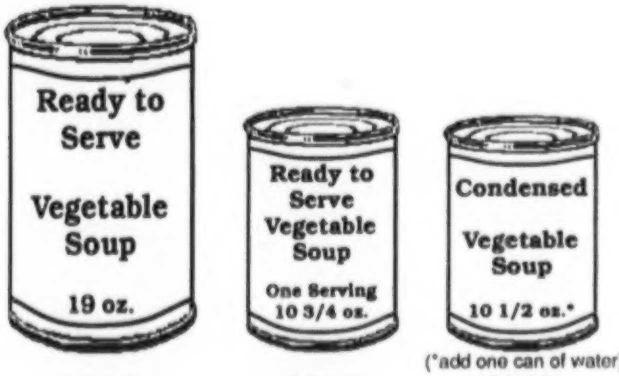
Comparison Shopping

To compare prices, the cost must first be reduced to unit price. In foods, the basic unit is usually the ounce. Buying decisions in comparison shopping are based on comparative cost as well as other factors such as convenience, possibility of waste or spoilage, purpose, and preference.

1. Based on unit cost, which size of canned pineapple is most economical?
2. If the 15 1/4 ounce can is on special for $0.79, does it become more economical than the 20 ounce can?
3. How much would 16 ounces of pineapple cost if purchased as two 8 ounce cans?
4. When might an 8 ounce can be the most practical buy?


PINEAPPLE
8 oz.
PINEAPPLE
15 1/4 oz.
PINEAPPLE
20 oz.

$0.55 $0.89 $1.09

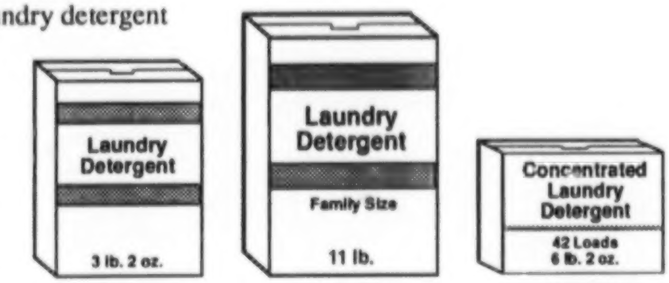

Ready to Serve
Vegetable Soup
19 oz.
Ready to Serve Vegetable Soup
One Serving
10 3/4 oz.
Condensed
Vegetable Soup
10 1/2 oz.*

(*add one can of water)

$1.09 $0.65 $0.63

5. What is the cost per ounce of prepared soup for each size can?
6. Which size can is the most economical buy?
7. Would the 10 3/4 ounce prepared soup ever be the most practical buy? Why?

8. What is the unit price per ounce of each size of granular laundry detergent (rounded to the nearest cent)?
9. In comparing regular granulated laundry detergent with *ultra* (condensed) granular detergent, why is it necessary to compare the cost per laundry load instead of cost per ounce?
10. How can the cost per laundry load be figured?
11. Assuming that a normal laundry load requires 2.9 ounces net weight of regular granular detergent and 2.3 ounces net weight of concentrated detergent, what is the cost per load for each of the detergents pictured?
12. Which box of granular detergent is the most economical?


Laundry Detergent
3 lb. 2 oz.
Laundry Detergent
Family Size
11 lb.
Concentrated Laundry Detergent
42 Loads
6 lb. 2 oz.

$2.49 $5.99 $7.99

Comparison Shopping
Answers

1. The 20 ounce size is most economical, costing $0.055 per ounce. By comparison, the 8 ounce can costs $0.069 per ounce and the 15 1/4 ounce can costs $0.058 per ounce.
2. Yes. The unit cost of the 15 1/4 ounce can would then be $0.052 per ounce.
3. $1.10
4. Answers will vary. Eight ounces would be practical in situations when only 8 ounces of pineapple is needed, and the remainder would be wasted.
5. The 10 1/2 ounce can of condensed soup equals 21 ounces prepared soup; the cost is $0.03 per ounce. The 19 ounce can costs $0.057 per ounce, and the 10 3/4 ounce can costs $0.060 per ounce.
6. The 10 1/2 ounce can of condensed soup is most economical.
7. Yes. If only one serving is needed, the single-serving size may be most convenient and may eliminate waste. Also, taste preference and value of ingredients should be considered.
8. The 3 pound 2 ounce regular granular detergent costs $0.05 per ounce; the 11 pound regular granular detergent costs $0.03 per ounce; and the 6 pound 2 ounce ultra detergent costs $0.08 per ounce.
9. In comparing regular granular detergent with *ultra* (concentrated), the cost per ounce is not comparable because fewer ounces of concentrated detergent are required per load of laundry. The only way to compare price is to compare detergent cost per load.
10. Divide the net weight of the box by the net weight of one recommended measure of detergent to determine the number of loads per box. Divide the cost of the box by the number of loads to compute the detergent cost per load. Concentrated granular detergents usually list the number of loads on the box label and also the net weight of detergent in one scoop, which is 2.3 ounces for the detergent in this activity. If the number of loads is not given, call or write the manufacturer to find the net weight of granular detergent required for a normal load. In the example given, both manufacturers of the regular granular detergent call for 2.9 ounces per load.
11. The $2.49 box of regular granular detergent costs $0.14 per load.
    3 pounds 2 ounces = 50 ounces
    50 ounces ÷ 2.9 ounces required per load = 17.2 loads per box
    $2.49 ÷ 17.2 loads = $0.14 per load

    The $5.99 box of regular granular detergent costs $0.10 per load.
    11 pounds = 176 ounces
    176 ounces ÷ 2.9 ounces required per load = 60.7 loads per box
    $5.99 ÷ 60.7 = $0.10 per load

    The $7.99 box of ultra detergent costs $0.19 per load.
    6 pounds 2 ounces = 98 ounces
    98 ounces ÷ 2.3 ounces required per load = 42.6 loads per box
    $7.99 ÷ 42.6 = $0.19 per load
12. The 11 pound box of regular granular detergent at $5.99 is most economical.

Bacteria, Molds, and Yeast

Bacteria, molds, and yeast are *microorganisms*, tiny organisms that divide and reproduce rapidly, producing chemicals that cause changes in foods and other organic materials. Some resulting changes are desirable. Action of microorganisms enables production of buttermilk, cheeses, bread, and antibiotics. Some changes are undesirable and can lead to food-borne illness that can be serious and even fatal. Microorganisms have certain requirements for growth. When deprived of these requirements, division and reproduction of microorganisms is inhibited or halted. For example, bacteria require warmth, moisture, and food. When food is preserved through drying, refrigerating, freezing, canning, irradiation, or chemical action, bacteria are deprived of basic needs and cannot continue to grow. Asking questions and performing experiments such as those below illustrate how microorganisms grow and what conditions promote or inhibit growth.

bacteria

- Prepare a three ounce box of gelatin according to package directions and pour into three shallow bowls to gel.
- Label the bowls as follows: Bowl 1, Bowl 2, and Bowl 3.
- In Bowl 1, place your finger 1/2" into the gelatin; hands should be of normal cleanliness, having handled books, pencils, and other routine school objects.
- Touch the floor, window sill, or other dusty surface with your finger; place the finger in Bowl 2.
- Carefully wash hands with soap and hot water and poke a clean finger 1/2" into Bowl 3.
- Place covers on the bowls and place them in a warm, dark place.
- Observe, record, and compare results for a period of one week.

molds

- With a sponge, dampen a portion of five bread slices.
- Place dust particles on the bread slices by gently wiping the damp portions over a dusty surface.
- Seal one slice in a plastic bag and store in a dark place.
- Seal another slice in a plastic bag and store in a light place.
- Leave one slice loosely wrapped in a napkin and place in a dark place.
- Leave another slice loosely wrapped in a napkin and place in a light place.
- Place one slice in the refrigerator.
- Observe, record, and compare results for a period of one week.

yeast

- Dissolve one tablespoon of sugar in a one-pint jar half filled with water.
- Add one teaspoon of yeast powder.
- Observe and record changes each day as yeast buds begin to grow. Note how the solution smells after a few days.
- Manipulate variables to see the differences when conditions change, such as temperature and light. For example, prepare several jars of sugar, water, and yeast. Leave one jar in a warm, light place; refrigerate one; cover one; and think of other variations. Observe differences in results.

- Take portions of dough prepared for a yeast bread recipe.
- Place one portion in a warm place to rise as directed in the recipe.
- Place one portion in the refrigerator.
- Place one portion in an oven set at the lowest temperature.
- Observe, record, and compare results.

discovery questions

- What is the relationship of sugar to yeast? Under what conditions do yeast buds thrive best? How does yeast cause bread to rise?
- What can be concluded about the relationship of cleanliness to bacteria growth? How might this relationship be explained?
- Under what conditions does mold reproduce most quickly? To keep bread fresh longer, what storage conditions are best?

Chemical and Physical Properties of Food

Directions: Conduct one or more of the following experiments to demonstrate the effects of preparation and storage on the chemical and physical properties of foods.

◆ Cut an apple in fourths.
Let one piece set out all period or overnight.
Wrap another piece in foil and a third in plastic wrap.
Treat the fourth piece with lemon juice or other citrus juice to show how acid can decrease tannin oxidation and improve aesthetic qualities of apples in salads.

◆ Cook one portion of frozen broccoli, Brussels sprouts, or cauliflower according to package directions and cover with a lid while cooking.
Cook another portion without a lid.
Taste test both portions.
The portion cooked without a lid may taste milder in flavor since sulfur in the vegetables was permitted to escape during cooking.

◆ Cook one package of broccoli with lemon juice added.
Cook another package in water.
Compare the color of the broccoli.
Note the drab color when broccoli is cooked in an acid medium.
Cook fresh, sliced beets using the same methods.
Compare the color.

◆ Cook one pan of carrots in an acid medium.
Cook another pan of carrots in an alkaline medium.
Note that the color pigment is not changed significantly in either medium.

◆ Demonstrate the texture and flavor differences of a vegetable when one portion is cooked in a pan with a lid and another is cooked in a pan without a lid, and both portions are cooked for the same amount of time.
Note that cooking with a lid shortens cooking time by creating a small amount of pressure and helps vegetables retain more nutrients.
The vegetable cooked without a lid may taste raw or uncooked.

◆ Taste test a box of cereal that is several weeks old.
Compare the flavor and texture of the old cereal to that of the same type of new cereal.
Point out reasons for change of flavor due to rancidity development.
Note changes in texture due to deterioration of additives such as BHT or BHA.

◆ Store part of a cream pie, chicken salad, tuna sandwich, or other food containing protein on an agar plate in the refrigerator.
Let another part set out several days on an agar plate.
Test both for contamination.
Note that protein foods are a good medium for bacterial growth.
Proper storage is essential to prevent spoilage.
Do not select custard or cream pies from an unrefrigerated case.

TA 11

Paychecks and Stubs

X Clothing Manufacturers
Pay Period 6/1-6/14 1991
Hours: 40 Regular 0 Overtime

Health Insurance Elections Emp (Y) Family (N) Dental (N)
Life Insurance Elections Emp (N) Dependent (N)
Company Savings Program (Y) % (5%)

Gross	194.00
Total Deductions	51.27
Net Pay	142.73

Gross Salary $ 194.00	FICA $ 12.98	Federal W/H $ 21.34	Insurance Health $ 7.25 Life $ 0.00	Savings Prgrm $ 9.70	Pension - 0 -
YTD $2134.00	YTD $141.78	YTD $234.74	YTD $79.75	YTD $106.70	YTD - 0 -

X Clothing Manufacturers
100 Main
Anytown, TX 12345

No. 607

June 14, 19 91

46-8776
9047

Pay to the Order of Rick Martinez $ 142.73

One hundred forty-two and 73/100 -- Dollars

THE BANK OF TEXAS
Anywhere, Texas 74634

For 40 hours regular

":984467845"\08947232 982:. 607

ABC Child Care, Inc.
Pay Period Ending 6/30/91

Salary		124.50
FICA	9.34	
Fed W/H	14.94	
Health Ins	5.00	
Savings Bonds	12.45	
Net Pay		82.77

ABC Child Care
#1 Central Circle
Anytown, TX 12345

No. 986

June 30, 19 91

57-5193
9047

Pay to the Order of Chris Stevens $ 82.77

eighty-two and 77/100 --- Dollars

THE BANK OF TEXAS
Anywhere, Texas 74634

For 30 hours

":984467845"\08563429 756:. 986

References

Alexander, P. et al. *Earth Science*. Morristown, New Jersey: Silver, Burdett & Ginn Inc., 1987.

American Association of University Women. *Shortchanging Girls, Shortchanging America.* Washington, D.C.: Author, 1991.

Berlin, G. and Sum, A. *Toward a More Perfect Union: Basic Skills, Poor Families, and Our Economic Future*. (Occasional Paper 3). New York, New York: Ford Foundation, 1988.

Bierer, L.M. and Lien, V.F. *Life Science*. Lexington, Massachusetts: D.C. Heath and Company, 1985.

Blackwell, D. and Henkin, L. *Mathematics: A Project 2061 Panel Report.* Washington, D.C.: American Association for the Advancement of Science, 1989.

Bottoms, G. and Korcheck, S.A. *Improving the Communications, Mathematics, and Science Competencies of Students Enrolled in Vocational Courses: A Report on the Second Annual Staff Development Conference of the SREB-State Vocational Education Consortium.* Atlanta, Georgia: Southern Regional Education Board, 1989.

Carnegie Council on Adolescent Development's Task Force on Education of Young Adolescents. *Turning Points: Preparing American Youth for the 21st Century.* Washington, D.C.: Glencoe/McGraw Hill Publishing Co., 1989.

Coble, C.R., Murray, E.G., and Rice, D.R. *Earth Science*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1987.

Council on School Performance Standards. *Preparing Kentucky Youth for the Next Century: What Students Should Know and Be Able to Do and How Learning Should Be Assessed.* Volume I. Frankfort, Kentucky: Author, 1989.

Hurd, D., Silver, M., Bacher, A.B., and McLaughlin, C.W. *Physical Science*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1988.

Goodlad, J. *A Place Called School: Prospects for the Future*. New York, New York: McGraw-Hill Book Co., 1984.

Jantzen, P.G. and Michel, J.L. *Life Science*. New York, New York: Macmillan Publishing Company, 1986.

Leyden, M.B., Johnson, G.P., and Barr, B.B. *Introduction to Physical Science*. Menlo Park, California: Addison-Wesley Publishing Company, 1988.

Lotto, L.S. *Building Basic Skills: Results from Vocational Education*. Columbus, Ohio: National Center for Research in Vocational Education, Ohio State University, 1983.

Mullis, I.V.S., Owen, E.H., and Phillips, G.W. *America's Challenge: Accelerating Academic Achievement*. Washington, D.C.: U.S. Department of Education, 1990.

National Research Council. *Everybody Counts - A Report to the Nation on the Future of Mathematics Education.* Washington, D.C.: National Academy Press, 1989.

Pasachoff, J.M., Pasachoff, N., and Cooney, T.M. *Physical Science.* Glenview, Illinois: Scott, Foresman and Company, 1986.

Pepple, J.D., Law, D.A., and Valdes, C. *Applied Academic Curricula: A Model for Integrating Academic and Vocational Education.* Berkeley, California: National Center for Research in Vocational Education, 1990.

Ramsey, W.L., Gabriel, L.A., McGairk, J.F., Phillips, C.R., and Watenpaugh, F.M. *Life Science.* New York, New York: Holt, Rinehart and Winston, Publishers, 1986.

Secretary's Commission on Achieving Necessary Skills. *What Work Requires of Schools: A SCANS Report for America 2000.* Washington, D.C.: U.S. Department of Labor, 1991.

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